Marvin Levy

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INTERNATIONAL CONFERENCE ON RESEARCH METHODOLOGY FOR ROADSIDE SURVEYS OF DRINKING-DRIVING -- ALCOHOL COUNTERMEASURES WORKSHOP

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Proceedings of a conference held in Paris, France on May 22-24, 1974.

16. Abstract

A conference was held on May 22-24, 1974 in Paris and was attended by 30 specialists interested in and associated with roadside surveys of the drinking-driving problem.

The basic purpose was to encourage more roadside surveys by furthering the research methodology and recommendations for conducting roadside surveys developed by a special group of the Organization for Economic Cooperation and Development.

The conference program included a review of classical and recent roadside surveys, a discussion of the methodology of roadside surveys and a demonstration of some basic roadside survey techniques by means of a special film developed for the purpose. In addition, a special manual was developed to expand some recommended survey techniques.

The conference developed interests in roadside survey techniques, the drinking-driving problem, and the need to develop countermeasures to reduce the problem.

Additional conferences on roadside surveys, including workshops on breath-testing instruments, were urged by delegates.

(See continuation sheet)

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16. Abstract (Continued)

This Conference was intended to produce as high a degree of standardization of statistics as possible commensurate with the legal, demographic, cultural, geographic and methodological variety between nations.

While the material developed in the London, Ottawa and Paris OECD Conferences served as the basis for such standardization, considerable discussion of the needs of the individual nations was generated by the Conference. The cross-fertilization resulting from the comments of many delegates was very stimulating and constructive.

For example, the delegates reaffirmed the recommendations coming out of the First International Conference on Driver Behaviour, Zurich October 1973, related to the involvement of alcoholic drivers in traffic crash morbidity and mortality; namely:

1. Countries should adopt a minimum set of data to be reported on all fatal crashes.
2. Every country should adopt standard criteria for defining a fatal road accident.
3. Countries should adopt a standard system for the reporting of the presence of alcohol in victims of fatal crashes.
4. Countries should conduct voluntary roadside surveys to measure the incidence of drinking drivers in traffic.

In addition, it was agreed that:

1. Countries should standardize roadside research methodology and recommendations for conducting roadside surveys, utilizing the Conference manuals as standards for the development of any data that will be used for international comparisons.
2. Countries may develop their own standards for roadside research methodology and recommendations for conducting roadside surveys, and they need not utilize the Conference manuals as standards, if there are no plans to use developed data for international comparisons.
3. If roadside surveys cannot be conducted, other efforts should be utilized to measure the incidence of drinking drivers in traffic, such as traffic law enforcement and hospital studies.
4. Traffic law enforcement agencies in most countries must be convinced of the need for roadside surveys to gather drinking driver data for meaningful traffic law enforcement emphasis programs. Traffic patrols and roadblocks will not produce the precise data needed for the development of such programs.
5. Local authorities in the roadside survey area should be involved in the planning and conducting of roadside surveys. Success of the survey team's efforts may well depend upon the degree to which local authorities are involved.
6. The public should be alerted about the roadside survey plans through news stories, pictures and announcements which explain the needs, operating procedures and the benefits that will accrue to the public. This practice will not adversely effect the survey or bias the results.

CONTENTS

INTERNATIONAL CONFERENCE ON RESEARCH METHODOLOGY FOR ROADSIDE SURVEYS OF DRINKING-DRIVING

1. SUMMARY

The International Conference on Research Methodology for Roadside Surveys of Drinking-Driving was held in Paris on May 22-24, 1974.

The highly successful conference was attended by thirty representatives from twelve nations and five international organizations. The nations included:

Austria	France	Netherlands
Belgium	Germany	Spain
Canada	Great Britain	Sweden
Finland	Italy	United States

The following international organizations were represented:

European Economic Community
World Health Organization
International Federation of Senior Police Officers
International Drivers' Behaviour Research Association
National Safety Council

Conference attendees are listed in Appendix A.

The conference furthered the experimental design and methodology core for conducting roadside surveys, on an internationally comparable basis, as developed by the Organization for Economic Cooperation and Development's Sub-Group on Roadside Surveys.

Presentations and discussions reviewed classical and current roadside surveys, studied the methodology for conducting roadside surveys and demonstrated basic roadside survey techniques by means of a special film developed by the National Safety Council's conference program team.

A demonstration of breath-testing techniques was held during the conference. A list of the persons involved in or associated with the demonstration is contained in Appendix B.

The Canadian Ministry of Transport's publication, Alcohol and Highway Safety: A Review of the Literature and a Recommended Methodology, was distributed to the participants and used as the basic reference for the conference. It is included in this report as Appendix C.

In additon, the National Safety Council's conference program team developed a manual to supplement the basic reference. It is attached to this report as Appendix D.

Although several nations have not conducted roadside surveys, as proposed during the 1972 Paris Conference, there was much interest in developing roadside survey techniques, the drinking-driving problem and the need to develop effective countermeasures to reduce the problem. Delegates urged the development of additional conferences on roadside surveys, including workshops on breath-testing instruments. The need for international cooperation on methodology and cooperative testing was recognized.

2. CONFERENCE ORGANIZERS

A special group of the National Safety Council's Committee on Alcohol and Drugs (the conference program team) included:

Robert F. Borkenstein, Chairman
M. W. Perrine, Member
William L. Spitler, Consultant
Lowell C. Van Berkom, Member
Elbert Hugunin, Secretary

This group developed the agenda, selected conference materials, expanded selected areas of roadside survey methodology in a special manual, prepared a roadside survey demonstration film and conducted the conference. See Appendix A for complete titles and addresses of the special group.

Secretary General T. A. J. Benjamin, International Drivers' Behaviour Research Association, Paris, selected the conference site, prepared and mailed invitations to possible participants and made many on-the-scene arrangements for the conference. His efforts contributed much to the success of the conference.

3. CONFERENCE OBJECTIVES

The main objective of the conference was to encourage more roadside surveys by furthering the research methodology and recommendations for conducting roadside surveys developed by OECD's Sub-Group on Roadside Surveys.

Another objective was to provide an opportunity for an exchange of experiences and opinions between experts in several disciplines concerned with drinking-driving behavior, with special attention to the methodology of roadside surveys designed to gather data for the development of effective countermeasures.

An additional objective was to provide an opportunity for a review of the progress being made in conducting roadside surveys as proposed for 1973-1974 during the Paris conference on June 28-29, 1972. A general statement regarding the objectives is contained in Appendix E.

4. CONFERENCE PROCEEDINGS

The conference program, contained in Appendix F, was divided into three basic presentations:

Roadside Surveys: Background and Rationale
Methodology of Roadside Surveys
Demonstration of Roadside Surveys

4.1 Roadside Surveys: Background and Rationale

This portion of the program included the purposes and functions of roadside surveys, the development of international cooperation and a review of classical roadside surveys.

4.1.1 Roadside Surveys of Drinking-Driving Behaviour

BRIAN CARR, Chief of Systems Evaluation
Road Safety Branch
Ministry of Transport, Canada

The presentation included the use of transparencies which are indicated in the accompanying boxes of the report.

ROADSIDE SURVEYS OF DRINKING-DRIVING PURPOSES AND FUNCTIONS

Many countries expend a considerable amount of time and energy in combatting the drinking-driving problem. Some techniques appear to be moderately effective in diminishing the problem, while other techniques appear not to have any effect whatsoever. It would, therefore, seem wise to concentrate on those activities which appear to be the most effective, and discontinue support for those countermeasures which are found to be ineffective. The problem has been in deciding which kind of measures are effective and which are not. In most cases, the data do not exist which will allow decisions to be made regarding the effectiveness of the various countermeasures.

While accident rates, and specifically, fatality rates are the ultimate measure of the effect of a countermeasure, they are subject to such a wide range of influences that they are seldom useful for directly evaluating a specific countermeasure. Information more directly relatable to outputs and activities of the countermeasure are required. In the case of the alcohol problem, what is needed is a direct behavioural measure of the involvement of alcohol in driving. Enter the roadside survey

> ROADSIDE SURVEYS
>
> AN INFORMATION-PRODUCING TOOL
> DESIGNED TO AID IN THE DEVELOPMENT
> AND EVALUATION OF AN IMPROVED SET
> OF DRINKING-DRIVING COUNTERMEASURES

I look upon roadside surveys of drinking-driving behaviour as an information producing tool designed to aid in the development and evaluation of an improved set of drinking-driving countermeasures. I will expand this idea by defining three principal objectives of roadside surveys.

> OBJECTIVES
>
> * TO CHARACTERIZE THE PROBLEM
> * TO SUPPORT INTERNATIONAL COMPARISONS
> * TO EVALUATE COUNTERMEASURES

First of all, roadside surveys can provide information on the nature and extent of the drinking-driving problem in a particular country. Secondly, a set of roadside surveys conducted using similar methodologies will allow an informed comparison of the drinking-driving problem in a wide range of countries, particularly when related to the set of alcohol countermeasures prevalent in each country. And thirdly, within each country a series of roadside surveys will provide trend information that should provide insight into the effect of countermeasures and other factors on the changing drinking-driving situation.

Allow me to expand on each of these three basic objectives.

The classical roadside surveys demonstrate at least that different countries can have very different drinking-driving problems. In many cases we are not able to successfully extrapolate from another country's experience for our own use because of a variety of different important factors, such as social, economic, cultural and political factors. Hence a country will first look to its roadside survey data for help in characterizing its own drinking-driving situation.

CHARACTERIZE THE PROBLEM

* AMOUNT OF NIGHTTIME DRINKING-DRIVING
* DRINKING-DRIVING vs DRIVER CHARACTERISTICS
* DRINKING-DRIVING vs TRIP CHARACTERISTICS
* DRINKING-DRIVING vs DRINKING CHARACTERISTICS
* DRINKING-DRIVING vs SITE CHARACTERISTICS

Of primary importance are the figures on how many drivers have been drinking and how many of these drinking drivers are likely to be impaired. While these qualities may also be broken down by driver characteristics, trip characteristics, site characteristics, etc., the overall figure will probably be the most quoted and the most used. It is interesting to note that the overall figure is quite often more difficult to get reliably, than the detailed figures. This is because a global figure requires a sample that accurately reflects drinking-driving behaviour averaged over all other variables. To arrive at such a figure it is necessary to choose sites in a way that will proportionately reflect in a correct manner, the overall distribution of driving in the country. This concept can be tricky to define precisely and even more difficult to gather the requisite data.

The availability and reliability of further breakdowns of drinking-driving behaviour will depend on the questions asked at the survey site, the form of the replies, and ultimately the sample size. Among the driver characteristics that are useful are - age, sex, educational levels, occupation, driver license type, and so forth. On top of this, reported drinking habits are frequently recorded, including drinking frequency, quantity and occasions, and drinking and driving frequency.

In order to determine under what conditions people drink and drive, information can be collected on trip's purpose, origination and destination, trip length, and the distance the driver is from home. To round out the survey data, information is usually collected on site characteristics including site location, road type and condition, and weather condition.

When it is known that specific countermeasures are to be evaluated or when specific matters concern the researchers, then relevant questions can be added to the questionnaire. Obviously the single, most important bit of information is the blood alcohol content of the driver, but additional information can often be gathered at relatively low additional cost.

CHARACTERIZE THE PROBLEM

ACCIDENT INVESTIGATION	→	DATA ON ACCIDENT POPULATION
ROADSIDE SURVEYS	→	DATA ON POPULATION AT RISK

Another way that survey data aids in characterizing the drinking-driving problem is when it is used in conjunction with other data bases; for example, accident investigation information can provide a profile of the accident population. This information becomes much more valuable when it can be compared with data on the "population at risk." This "exposure data" is precisely what is collected by roadside surveys. Several of the classical roadside surveys have had this function primarily in mind and so they chose survey sites and times that corresponded with those of selected accidents.

CHARACTERIZE THE PROBLEM

LABORATORY EXPERIMENTS	→	EFFECTS OF ALCOHOL ON BEHAVIOUR
ROADSIDE SURVEYS	→	INCIDENCE OF DRINKING-DRIVING

Another comparison data set for roadside survey information is the information gathered in laboratory experiments of the effect of alcohol on behaviour. Laboratory tasks can be designed to simulate or otherwise represent the kind of task load experienced by a drinking driver. Roadside survey information can give a very good feel for the overall incidence of drinking-driving behaviour on our road system.

One of the difficulties that the researcher experiences in dealing with a real life problem like drinking and driving is that it can be very difficult to use the techniques of experimental design in practice. For example, in a laboratory a variety of treatments can be randomly applied to a group of subjects. This is seldom practical when the treatments are alcohol countermeasures and the subjects are drinking drivers. However, we can approximate the benefits of experimental design if we can find a number of similar regions with a different set of countermeasures.

COMPARISONS

TO PROVIDE INSIGHT INTO THE RELATIONSHIP BETWEEN DRINKING-DRIVING AND COUNTERMEASURES, AND OTHER SOCIO-ECONOMIC, CULTURAL AND POLITICAL FACTORS

Roadside survey data on the incidence and characteristics of drinking-driving may be able to provide some insights into the effects of these countermeasures. It goes without saying that a number of possible sources of error and misinterpretation are introduced in this type of pseudo-experiment, but beggers can't be choosers.

COMPARISONS

* INTRA-REGIONAL
* INTER-REGIONAL
* INTERNATIONAL

Comparisons can be made within and between regions in a given country, or between countries. For example, in Canada, some of our provinces have enacted provincial drinking-driving legislation that is different from legislation elsewhere in the country. Our national roadside survey presently in progress should provide some capability to compare results and hence provide some insight into the countermeasures' effectiveness. On an international basis, roadside surveys that have been conducted to date indicate that there are substantial similarities between the United States and Canada in the drinking-driving problem area. Therefore, it may be possible to use one country as a pseudo-control group for the other country when major changes are introduced on a national basis.

As I indicated initially, the primary purpose of the roadside survey is to provide information that can enable improved alcohol countermeasures to be developed. A first national survey will act as baseline information that represents the drinking-driving situation as it exists in one particular point in time.

EVALUATE COUNTERMEASURES

* BASELINE INFORMATION
* BEFORE-DURING-AFTER STUDIES
* TREND INFORMATION

Subsequent surveys will provide trend information reflecting the result of all changes on the drinking-driving problem. When major countermeasures are to be evaluated, then well-timed surveys will indicate changes during and after the program's introduction. To date in Canada we have evaluated a public education campaign conducted over the Christmas period. "Before" and "After" roadside surveys indicated a greater reduction in drinking-driving in our campaign city than in a similar control city not exposed to the campaign.

The United State has invested considerable time, energy and resources into their alcohol safety action projects experimentally introduced into a number of states. Each of these projects calls for continuing evaluation. Each evaluation calls for roadside surveys to provide a direct behavioural measure of the effects of the set of countermeasures introduced under the alcohol program.

POTENTIAL PROBLEMS OF ROADSIDE SURVEYS

* REFUSALS
* DRIVER/POLICE/RESEARCHER REACTION
* TECHNICAL PROBLEMS
* COST

All of these benefits of roadside surveys, however, cannot be gathered without associated problems. I will just briefly mention some of the most critical. First there is the problem of refusal to cooperate on the part of the driver. Since it is reasonable to suppose that drinking drivers refuse relatively more frequently than non-drinking drivers, a high refusal rate would indicate that the blood alcohol results are biased downwards, perhaps drastically so. The driver, the police officer and the researcher are all acting from different sets of objectives, expectations, and images of their roles. It cannot be overemphasized too strongly the need to ensure that problems arising out of the driver-police-researcher interaction do not jeopardize the study.

Breath testing and other equipment problems can also jeopardize the project's reliability as can the ever present spectre of mounting costs.

ADVANTAGES OF ROADSIDE SURVEYS

* CONDUCTED IN RELEVANT ENVIRONMENT
* DIRECT MEASUREMENT OF BAC LEVELS
* CONTACT WITH DRIVING PUBLIC

To conclude, let me just run over some of the advantages of roadside surveys. These surveys are conducted in the actual environment experienced by the driving public. No laboratory experiment can duplicate this environment successfully. The direct measurement of blood alcohol content levels provides a measure related to specific behaviour, rather than reported behaviour, which can be quite biased. And thirdly, roadside surveys provide an opportunity to contact a fairly large sample of the driving public. The communication that results in this contact should implicitly, at least, provide the driver with an appreciation of the importance of the drinking-driving problem and a knowledge that "something is being done about it." This opportunity for increasing public awareness of the seriousness of the drinking-driving problem should not be overlooked.

4.1.2 International Cooperation

PROFESSOR LEONARD GOLDBERG
Karolinski Institute
Stockholm, Sweden

Professor Goldberg reviewed the development of international cooperation to standardize the methodology of roadside surveys, including:

The September 24, 1971 meeting in London, England, at which the Plenary Group of the Organization for Economic Cooperation and Development's Initiated Group of Experts on the Effects of Alcohol and Other Drugs on Driver Behaviour proposed the creation of a Sub-Group on Roadside Surveys. The activities of the Sub-Group were to be coordinated by Dr. Carl Stroh of Canada.

On March 6-9, 1972, a meeting was held in Ottawa, Canada. Canada had invited 23 countries to send delegates to the meeting for the purpose of delinearing and specifying a basic experimental and methodological core which would be adhered to by all countries wishing to conduct roadside surveys of the blood alcohol concentrations in the driving population. Considerable progress was made during this effort.

On June 28-29, 1972, the Sub-Group on Roadside Surveys met in Paris, France to continue the work started in Ottawa. The work produced a statement on research methodology and recommendations for conducting roadside surveys. (Refer to pages 56-66 of Appendix C.)

4.1.3 A Review of Classical Roadside Surveys of Drinking-Driving Behaviour

BRIAN CARR, Chief of Systems Evaluation
Road Safety Branch
Ministry of Transport, Canada

REVIEW OF CLASSICAL ROADSIDE SURVEYS OF DRINKING-DRIVING BEHAVIOUR

This review of classical roadside surveys has been compiled almost entirely from the Canadian report, Alcohol and Highway Safety: A Review of the Literature and a Recommended Methodology. This report has been made available to you in English and, in limited numbers, in French.

The purpose of this review is to briefly outline the methodology and results of a selected number of classical roadside surveys. Without going into great detail, I will highlight those aspects of the surveys that are of some relevance to our discussions this week.

EVANSTON, ILLINOIS	R. L. HOLCOMB 1938
SAMPLE PERIOD	- 1 WEEK, CONTINUOUS
LOCATION	- 8 SITES - 4 NEAR LIQUOR OUTLETS 4 NOT
TESTING DEVICE	- BALLOONS/HARGER DRUNKOMETER
PERSONS TESTED	- 1750
RESULTS	- 12% HAD BEEN DRINKING 6% HAD BAC OVER 50 MG 1% REFUSED

The first roadside survey of drivers' blood alcohol content took place in Evanston, Illinois in 1938. Mr. R. L. Holcomb obtained 1750 samples over a one-week period by having the police randomly stop passing motorists and refer them to a testing team. Continuous testing was conducted from midnight on Friday, April 22, until 0600 hours on Monday, April 25, and then alternate day and night samples were collected until Saturday, April 30. The survey was conducted at eight locations, four of which were within areas where drinking drivers were thought to be prevalent (proximity of liquor outlets), and the remaining four locations were in areas where drinking drivers were thought not to be prevalent. Breath samples were gathered in a specially constructed wide mouth balloon. The sample was immediately tested in a trailer laboratory to determine first, if alcohol was present, using a qualatative test, and second, when alcohol was detected, a quantitative analysis was made on a Harger Drunkometer.

The survey found that 12% of all drivers tested had been drinking, 6% had a BAC over 50 milligrams and 2% had a BAC over 100 mg. The refusal rate was reported to be 1%. The study also concluded that the age range from 25 to 30 was the most likely to have been drinking, that a woman driver was as likely to have been drinking as a male driver, and that most drinking was done on the week-end, the largest number of drinking drivers being detected during the early hours of Sunday morning.

TORONTO, ONTARIO	G. H. LUCAS	1951-52
SAMPLE PERIOD	- 11 MONTHS, 1830-2230, MONDAY TO SATURDAY	
LOCATION	- ACCIDENT SITES	
TESTING DEVICES	- BALLOONS/HARGER DRUNKOMETER, GREENBERG ALCOMETER	
PERSONS TESTED	- 2015	
RESULTS	- 8.7% HAD BAC OVER 50 MG	

The next survey took place in Toronto, Ontario, during 1951-52. A research team headed by G. H. Lucas gathered samples from non-accident involved drivers who were at the accident site at the same time, traveling in the same direction, and in cars of the same vintage as were the accident-involved drivers. Four non-accident involved drivers were sampled at each accident scene for a total of 2015 non-accident involved drivers. As in Holcomb's study, breath samples were collected in plastic balloons and later analyzed on either a Harger Drunkometer or a Greenberg Alcometer. No specific information is available on the per cent of drivers that had been drinking, but 8% had a BAC over 50 mg. No information is available on the refusal rate.

A basic difference in these two surveys was the fact that in the Toronto survey accident sites were chosen for the survey of non-accident involved drivers in order to identify a highly specific population at risk. The Evanston study was more interested in gathering information on the drinking-driving phenomenon without direct reference to accident involvement.

BRATISLAVIA, CZECHOSLAVAKIA - ROAD SAFETY DEPARTMENT	
SAMPLE PERIOD	- 2 NIGHTS, SATURDAY AND TUESDAY: 2200-0300
LOCATION	- HIGHWAY TRAFFIC VIOLATION AREA
TESTING DEVICE	- HARGERSCH TEST, BLOOD TEST
PERSONS TESTED	- 113
RESULTS	- 49.5% HAD BAC OVER 50 MG 0% REFUSED

The first European study for which we have information was conducted in 1956-57 in an around Bratislava, Czechoslovakia. In fact there were three surveys, the first of which is supported on the slide. Extremely high levels of blood alcohol were found as nearly half of the drivers had levels over 50 mg. The study reports no refusals.

Later analysis showed that the site locations were in areas of high speeding and other traffic violations. The two other surveys were daytime surveys and detected lower involvement of alcohol in driving, namely in the order of 11% over 50 mg. It appears that all three surveys suffered from some major methodological problems that make the results difficult to interpret.

GRAND RAPIDS, MICHIGAN--R. F. BORKENSTEIN	1962-63
SAMPLE PERIOD	- 12 MONTHS, ACCIDENT DAYS AND TIMES
LOCATION	- ACCIDENT SITES
TESTING DEVICE	- POLYETHELYNE BAGS/BREATH-ALYZER
PERSONS TESTED	- 7590
RESULTS	- 10.9% HAD BEEN DRINKING 2.4% HAD BAC OVER 50 MG 2% REFUSED

Perhaps the most referenced roadside survey was conducted in Grand Rapids, Michigan in 1962-63 by Dr. R. F. Borkenstein. This survey also used accident locations to determine survey sites. The survey lasted for a full year, using site times and days to correspond as closely as possible with a time and day of the related accident. Four breath samples were collected at each site in polyethelyne bags that were returned to the laboratory for later analysis on the Breathalyzer.

The results indicated that 10.0% of the surveyed drivers had been drinking, with 2.4% over 50 mg. The 25-34 year age bracket had the highest proportion of drivers over 80 mg, while the drivers in the extreme age brackets - that is, younger than 17 and older than 65 - were the least likely to have high blood alcohol content. Several factors were found to be related to the likelihood of a driver being impaired, namely, separation or divorce, low levels of education, high mileage rate and non-white racial characteristics.

This survey stands out in the literature because of the precision with which it was conceived and carried out, the large number of subjects that were tested, thereby increasing the reliability of the results, and the thoroughness with which the study has been documented, thereby being very useful in the design of subsequent surveys.

BURLINGTON, VERMONT	W. PERRINE 1969
SAMPLE PERIOD	- 24 MONTHS, ACCIDENT DAYS AND TIMES
LOCATION	- FATAL ACCIDENT SITES
TESTING DEVICE	- MOBAT SOBERMETER, BREATHALYZER
PERSONS TESTED	- 1184
RESULTS	- 25% HAD BEEN DRINKING 10% HAD BAC OVER 50 MG 7% REFUSED

Messrs. Perrine, Waller and Harris conducted a two-year roadside survey in Burlington, Vermont in 1969, using fatal accident sites for the survey locations. 1184 persons were tested on the Mobat Sobermeter, or on the Borkenstein Breathalyzer. 25% of the drivers tested had been drinking, with 10% over 50 mg, and 3% over 100 mg. The refusal rate was 7%. In this survey, six interviews were obtained at each survey site from motorists who were traveling in the same direction as the crash-involved driver had been traveling.

FRANCE	O.N.S.E.R.
SAMPLE PERIOD	- 15 WEEKS, ALL DAY, ALL WEEK
LOCATION	- RANDOM
TESTING DEVICE	- BREATHALYZER
PERSONS TESTED	- 7300
RESULTS	- 52.5% HAD BEEN DRINKING 6.9% HAD BAC OVER 50 MG REFUSAL RATE NOT KNOWN

In 1969 a large roadside survey was conducted in France during the summer and fall months. The 7300 breath samples were analyzed on the Breathalyzer with results indicating that 52.5% of the drivers had been drinking, 6.9% had BAC over 50 mg. Survey sites were chosen on a random basis. Men were found to be more likely to be drinking and driving than were women and separated and divorced drivers were most often found to be in the high BAC range than were married drivers.

The report for this study has not been published, but it is expected within the next two months. I have been told since this slide was made up that the refusal rate was about 0.5%.

NETHERLANDS	1970, 1971
SAMPLE PERIOD	- 3 MONTHS, 0200-0400 FRIDAY, SATURDAY, SUNDAY
LOCATION	- 114 RANDOM URBAN SITES
TESTING DEVICE	- BLOOD TEST, 2 BREATH TESTS
PERSONS TESTED	- 2675 IN 1970 2967 IN 1971
RESULTS	- IN 1970, 26% HAD BEEN DRINKING 12% HAD BAC OVER 50 MG 14% REFUSED IN 1971, 33% HAD BEEN DRINKING 17% HAD BAC OVER 50 MG 13% REFUSED

During the Dutch survey of 1970, complete data were collected on 2675 subjects. The survey lasted three months and used both blood and breath tests to determine blood alcohol content. 26% of those tested had been drinking, while 12% had a BAC over 50 mg. The refusal rate was 14%. In 1971 the survey was replicated; this time data were collected on 2967 drivers. 33% of these drivers had been drinking and 17% had blood alcohol content over 50 mg.

For both surveys, sites were chosen randomly in urban areas.

OSLO, NORWAY	1970, 1971
SAMPLE PERIOD	- 24 MONTHS APPROX. 2200-0200
LOCATION	- RANDOM (?)
TESTING DEVICE	- ALCOTEST
PERSONS TESTED	- 1946
RESULTS	- 2.8% HAD BEEN DRINKING 1.9% HAD BAC OVER 50 MG 1% REFUSED

A roadside survey was conducted in Norway in 1970-71. Specific information was not available to me as to how sites were chosen for this two-year survey. Almost 2000 persons were stopped and out of these 1% refused to give a breath sample. The Alcotest was used in all cases, with a follow-up blood test when intoxication was suspected.

This survey produced the lowest level for drinking and driving of all surveys reported in this review. 2.8% of the drivers had been drinking but 2/3rds of these drinking drivers had blood alcohol contents over 50 mg. This distribution of drinking and driving is quite unlike anything that has been found in North America and most of the rest of Europe, to my knowledge.

ALBERTA	MINISTRY OF TRANSPORT 1971
SAMPLE PERIOD	- 16 DAYS, 2100-0300 ALL DAYS
LOCATION	- RANDOM
TESTING DEVICE	- BREATHALYZER
PERSONS TESTED	- 1897
RESULTS	- 26% HAD BEEN DRINKING 12.9% HAD BAC OVER 50 MG 6% REFUSED

The final survey that I will report on at this time is a Canadian survey conducted in 1971 in the Province of Alberta. 2022 drivers were asked to take part in the study and out of these 6% refused to participate. Of the remainder, 26% had been drinking and 12.9% had a blood alcohol content over 50 mg. It should be pointed out that in this survey the police screened all drivers passing the site before the survey crew could select their samples. In total, 34 drivers were charged with impaired driving by the police. As a result of this there is likely a small bias in the displayed figures.

Of course there are other surveys that could have been reported on here, for example surveys in Michigan in 1970 and Albuquerque, New Mexico in 1971 produced drinking-driving figures very similar to those in the Alberta study, despite the fact that there were some minor differences in survey procedures. Generally speaking, however, it is very difficult to draw strict comparisons among all these surveys because of different methods of choosing sites, difference hours, days of the week and months of the year used for sampling, different measuring devices for breath testing, and differing levels of overall reliability. It goes without saying, that it is just this lack of comparability that the International Roadside Survey Methodology has been designed to eliminate.

There is ample evidence that roadside surveys can be conducted successfully - from the point of view of the researcher in terms of reliable results, from the point of view of the program administrator in terms of program evaluation, from the point of view of the police officer in terms of no loss of public goodwill, and finally from the point of view of the motorist himself in terms of his own curiosity and concern and without major inconvenience to him.

4.2 Review of Recent National Surveys

During this session of the conference program selected nations were requested to present reports on recent roadside surveys and other nations represented at the conference were given an opportunity to report on recent roadside survey activities.

4.2.1 CANADA - BRIAN CARR, Chief of Systems Evaluation, Road Safety Branch, Ministry of Transport, Canada

The Canadian Ministry of Transport has conducted four recent projects to evaluate existing Canadian countermeasures, including:

- The Edmonton Study - October 1973
- The Breathalyzer Legislation - An Inferential Evaluation - October 1973
- The Evaluation of the Alberta Impaired Drivers Project (a rehabilitation program) - not yet published
- The Evaluation of the Drinking/Driving Public Education Campaign in Saskatchewan - not yet published

4.2.2 UNITED STATES - DR. ROBERT B. VOAS, Chief Demonstration Evaluation Division, Office of Driver and Pedestrian Programs, U. S. Department of Transportation, Washington, D. C.

Dr. Voas reported on the 1973 U. S. national roadside breath-testing survey procedures and results and the results of roadside voluntary surveys conducted in connection with 19 alcohol safety action projects.

1973 U. S. NATIONAL ROADSIDE BREATHTESTING SURVEY PROCEDURES AND RESULTS

In the fall of 1973 the Highway Safety Research Institute, University of Michigan, conducted a nationwide voluntary roadside breathtesting survey for the National Highway Traffic Safety Administration. This was the first such national survey to be conducted under the guidelines of the OECD Initiated Group of Experts on the Effects of Alcohol and Other Drugs on Driver Behaviour. A total of 3,698 motorists were randomly stopped at 185 roadside locations in 24 primary sampling areas in 18 states across the United States between 10:00 p.m and 4:00 a.m. on Friday and Saturday nights during the period from October 26 to December 16. From these motorists 3,358 interviews and 3,192 satisfactory breath test analyses were obtained.

The basic objective of the survey was to estimate the extent of driving after drinking during the survey hours in the United States. The survey found that 22.6% of the national sample had been drinking (0.02% W/V Blood Alcohol Concentration or higher). 13.5% had been drinking enough to involve probable impairment of their driving (0.05% BAC or higher), 5.0% had been drinking enough to be considered legally impaired in all states (0.10% BAC or higher), and 1.4% were definitely intoxicated (0.15% BAC or higher). The proportions of motorists driving after drinking increased considerably from the beginning to the later survey hours, more than doubling between 10:00-11:00 p.m. and 2:00-3:00 a.m. However, a comparison of the data from Friday and Saturday nights showed only slightly more driving after drinking on Saturday nights than on Friday nights.

In regard to type of roadway it was found that driving after drinking was slightly more prevalent on less heavily traveled roads and in more open and rural areas. When the various survey localities were compared with each other tremendous variation was found, as would be expected given the limited numbers of respondents in each locality. However, there was still a general tendency for the more rural areas to have higher percentages of drinking drivers. This was also reflected in the regional comparisons which found somewhat higher percentages of probably impaired driving in the south (14.8%) and midwest (14.1%) than in the northeast (12.6%) and west (11.7%).

Turning to personal characteristics of the nighttime drivers, the data show disproportionately more driving after heavy drinking among males, blue collar workers, non-highschool graduates, divorcees, persons aged 21-44, low mileage drivers, drivers traveling alone and on short trips, drivers traveling to or from eating places, and persons who consider themselves moderate or heavy drinkers. It was also found that heavy drinking drivers as compared with the other drivers were less likely to have discussed drunk driving in the previous month; were more likely to overestimate or to underestimate the percentage of traffic fatalities involving drinking drivers; were more likely to think problem drinkers cause more accidents than social drinkers; were more likely to have tried to persuade others not to drive in the previous year; and were more less likely to express willingness to pay more taxes for governmental alcohol safety programs.

The complete Highway Safety Research Institute report explains the survey design and procedures and describes the analytical findings listed above in much greater detail. The report concludes with the observation that such a national roadside breathtesting survey has been demonstrated to provide useful information at a reasonable cost, and it offers ten suggestions for improving the operation of such a future survey. The complete report is available from the Office of Alcohol Countermeasures.

Extensive appendices include much detailed information about the survey operation. The appendices also include codebooks with marginal distributions of the survey results, both for the 3,698 individual respondents and for the 185 roadside sites.

The following data are extracted from the report for discussion:

Table 1 - Comparisons of national BAC results using unweighted data, data weighted by speed/traffic factors and population factors, and data weighted by speed/traffic and population and drinking estimate factors, for total sample and two time periods, in percent.

Table 2 - National BAC results and demographic characteristics of the drivers; sex, race, age, education, marital status, and occupation; using speed/traffic, population, and drinking estimate weights, in percent.

Table 3 - National BAC results and driving characteristics of the drivers; passengers annual mileage, trip purpose, trip length; using speed/traffic, population and drinking estimate weights, in percent.

TABLE 1. COMPARISONS OF NATIONAL BAC RESULTS USING UNWEIGHTED DATA, DATA WEIGHTED BY SPEED/TRAFFIC FACTORS AND POPULATION FACTORS, AND DATA WEIGHTED BY SPEED/TRAFFIC AND POPULATION AND DRINKING ESTIMATE FACTORS, FOR TOTAL SAMPLE AND TWO TIME PERIODS, IN PERCENT

Time and Weight Factors	No.	BAC Readings .00-.01	.02-.04	.05-.07	.08-.09	.10-.14	.15+
10-12PM	1657						
No Weighting		83.5	7.5	4.4	1.6	2.0	.9
Speed/Traffic and Population		83.1	7.8	4.7	1.5	2.0	1.0
Speed/Traffic, Population and Drinking Estimate		82.9	7.7	4.8	1.5	2.1	1.1
1-3AM	1541						
No Weighting		66.7	12.0	8.4	4.7	6.4	1.9
Speed/Traffic and Population		66.0	12.7	8.1	4.6	6.7	1.8
Speed/Traffic, Population and Drinking Estimate		66.5	12.4	8.0	4.5	6.7	1.9
TOTAL	3192						
No Weighting		75.5	9.6	6.3	3.1	4.1	1.4
Speed/Traffic and Population		77.2	9.4	6.1	2.4	3.5	1.4
Speed/Traffic Population and Drinking Estimate		77.4	9.2	6.1	2.4	3.6	1.4

TABLE 2. NATIONAL BAC RESULTS AND DEMOGRAPHIC CHARACTERISTICS OF THE DRIVERS: SEX, RACE, AGE, EDUCATION, MARITAL STATUS, AND OCCUPATION: USING SPEED/TRAFFIC, POPULATION, AND DRINKING ESTIMATE WEIGHTS, IN PERCENT

	Wtd. No.	BAC Reading .00-.01	.02-.04	.05-.07	.08-.09	.10-.14	.15+
Sex							
Male	3101	75.7	9.8	6.4	2.7	3.8	1.6
Female	586	85.1	6.5	4.7	1.1	2.3	0.3
Race							
White	3230	77.9	8.9	5.7	2.5	3.7	1.3
Black	328	72.9	11.9	7.2	2.5	2.7	2.8
Age							
16-17	242	88.4	3.3	3.8	1.7	2.7	0.0
18-20	596	81.5	7.3	5.3	1.7	3.0	1.2
21-24	622	74.6	10.6	6.7	2.9	4.2	1.0
25-34	948	74.1	10.7	6.9	2.2	4.6	1.6
35-44	481	74.6	9.5	6.1	3.9	4.3	1.6
45-54	436	78.6	8.0	6.6	2.4	2.2	2.2
55-64	231	78.2	11.5	4.6	2.6	1.0	2.1
65+	71	85.8	5.0	5.5	1.8	2.0	0.0
Education							
High School Not Finished	956	79.0	6.2	6.4	2.1	4.3	2.0
High School Finished	1257	77.0	10.0	5.6	2.9	3.5	1.2
Some College	873	77.6	8.8	6.3	2.6	3.3	1.4
College Finished	542	74.9	13.0	6.4	2.2	2.7	0.9

TABLE 2 (Continued)

	Wtd. No.	BAC Reading .00-.01	.02-.04	.05-.07	.08 .09	.10-.14	.15+
Marital Status							
Married	1799	77.8	8.6	5.9	2.6	3.5	1.5
Single	1497	79.8	9.0	4.9	2.2	3.3	0.8
Divorced	222	66.1	15.6	11.0	4.7	4.6	3.0
Separated	69	62.6	11.1	15.3	0.0	7.2	3.9
Widowed	45	69.5	2.0	12.5	0.0	1.1	4.9
Occupation							
Unemployed	180	76.5	13.3	4.3	2.0	3.9	0.0
White Collar	1172	75.7	12.2	5.7	2.4	3.0	0.9
Blue Collar	1732	76.0	8.2	6.9	2.9	4.1	2.0
Farmer	23	82.2	15.8	0.0	0.0	1.9	0.0
Housewife	90	92.9	3.0	2.3	1.2	0.0	0.5
Student	433	84.3	4.8	6.1	1.8	2.9	0.1

TABLE 3. NATIONAL BAC RESULTS AND DRIVING CHARACTERISTICS OF THE DRIVERS: PASSENGERS ANNUAL MILEAGE, TRIP PURPOSE, TRIP LENGTH: USING SPEED/ TRAFFIC, POPULATION AND DRINKING ESTIMATE WEIGHTS, IN PERCENT

	Wtd. No.	BAC Reading					
		.00-.01	.02-.04	.05-.07	.08-.09	.10-.14	.15+
No. of Passengers							
None	1186	79.2	8.0	5.3	1.5	4.1	1.9
One	1368	75.9	10.6	5.6	3.3	3.3	1.1
Two or More	917	76.4	8.9	8.0	2.4	2.8	1.4
Annual Mileage							
Under 10,000	820	77.1	8.2	5.8	2.3	4.9	2.1
10,000-20,000	1472	78.3	9.2	5.8	2.3	3.4	0.9
20,000-30,000	622	74.7	11.5	6.2	3.8	3.0	0.8
Over 30,000	578	79.7	7.5	6.5	2.0	2.3	1.9
Trip Purpose							
Social (Friend's Home)	1122	76.9	10.0	7.0	2.2	3.0	1.1
Recreational, Cultural	370	88.8	5.5	2.7	0.9	2.1	0.0
To or From Eating or Drinking Places	874	67.0	14.0	7.3	3.8	5.9	2.0
Between Eating or Drinking Places	105	46.2	19.6	15.6	8.8	7.5	2.3
To or from Work	561	89.2	3.1	4.1	1.6	0.8	1.2
Just Driving Around	68	80.1	3.8	9.0	1.6	5.5	0.0
Other	518	81.2	7.2	3.7	1.9	3.8	2.2
Trip Time							
0-5 minutes	343	76.4	9.0	5.3	2.8	4.7	1.7
6-10 minutes	506	70.9	13.0	8.1	2.6	3.6	1.9
11-20 minutes	1185	76.4	8.4	7.5	2.7	3.8	1.3
21-30 minutes	647	81.6	8.5	5.0	2.1	1.9	0.9
31-50 minutes	426	78.4	9.3	3.7	2.5	4.0	2.2
51-100 minutes	271	82.3	8.3	4.1	1.9	3.0	0.4
101-200 minutes	134	75.7	8.1	6.3	2.0	5.0	3.0
More than 200 minutes	66	89.5	1.7	7.0	1.8	0.0	0.0

SUMMARY OF RESULTS OF ROADSIDE VOLUNTARY SURVEYS
CONDUCTED BY 19 ALCOHOL SAFETY ACTION PROJECTS

See Appendix G for materials presented by Dr. Voas.

4.2.3 FRANCE - M. J. L'HOSTE, O.N.S.E.R., Paris, France submitted the following statement:

It has been hoped that certain countries, including France, would conduct roadside surveys during 1973-1974.

So far as France is concerned, difficulties in obtaining the required agreements from the several agencies and departments involved has prevented the running of a roadside survey during the planned survey period.

Currently, the absence of the required approvals and agreements make it impossible to say when the study will be conducted or even whether it will be conducted at all.

4.2.4 NETHERLANDS - PETER C. NOORDZIJ, Institute for Road Safety Research, Voorburg, Netherlands

A brief report on roadside surveys conducted during 1970 and 1971 was presented and some of the data gathered was highlighted, as follows:

Percentage Distribution by BAC

Year	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
1970	73	14	8	5
1971	64	17	10	8

Percentage Distribution for Female Drivers

Year	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
1970	94	4	2	-
1971	85	9	4	2

Percentage Distribution for Male Drivers - 1970

Age	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
-25	73	16	8	4
25-35	71	16	7	6
35-50	67	17	10	6
50+	76	11	7	6

Percentage Distribution for Male Drivers - 1971

Age	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
-25	62	20	10	8
25-35	60	18	13	10
35-50	68	16	9	7
50+	77	13	6	7

Percentage Distribution by Time - 1971

Time	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
2200-2400	77	14	5	4
2400-0200	54	21	14	11
0200-0400	42	19	21	18

Percentage Distribution by Time - 1971
Returning from Visit

Time	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
2200-2400	81	13	4	2
2400-0200	58	23	13	6
0200-0400	41	20	19	20

Percentage Distribution by Time - 1971
Returning from Bar

Time	BAC (mg/ml)			
	0 - 10	10 - 50	50 - 100	100+
2200-2400	48	18	13	11
2400-0200	39	21	18	13
0200-0400	28	17	30	14

4.2.5 FINLAND - PROFESSOR M. LINNOILA, Departments of Pharmacology and Forensic Chemistry, University of Helsinki, Helsinki, Finland

Finnish road traffic law prohibits the operation of a motor vehicle while under the influence of alcohol or other agents that impair the driving ability. When police believe that a driver is under the influence of alcohol he is subjected to a breath test. If the breath test reveals a blood alcohol concentration in excess of 30 mg/ml, the case is considered to be positive. After a positive breath test, the driver is taken to a physician for an investigation and the collection of a blood sample for the accurate determination of the blood alcohol concentration. If a breath test is negative, and the police have good reason to believe that some agent other than alcohol has been used by the driver, he is taken to a physician for investigation and the collection of blood and urine to determine qualitatively and quantitatively the agent used.

In 1970 there were 9,174 positive breath tests; in 1973 there were 13,908 positive tests. During this period of time the number of motor vehicles increased from 100,000 to 125,000. From 1968 to 1972 the amount of alcohol consumed in Finland increased by 60%, and in 1972 the average alcohol consumption was 4.3 liters. Police activities to control drinking drivers have not kept pace with the increase of motor vehicles and the consumption of alcohol.

In 1970, 73% of the drunk drivers had blood alcohol concentrations in excess of 120 mg/ml; the percentage increased to 75.8% in 1973. In 1971, 113 women were listed as drunk drivers; the number increased to 176 in 1973.

From these data one can conclude that driving under the influence of alcohol in Finland has increased at a rate comparable to the increase in alcohol consumption, and at a rate much faster than the increase in motor vehicles. Stringent legislation has not been effective in preventing the increase of drunk driving in Finland

Within the provisions of the traffic control system, the Finnish police could conduct roadside surveys to determine the extent of drinking in the driving population. The police could develop data on examined drivers such as age, sex, type of vehicle and mileage driven per annum. Every driver could be required to take the breath test without an assumption that there was alcohol consumption prior to the test request.

4.3 Methodology of Roadside Surveys

This portion of the conference program dealt with the research methodology and recommendations for conducting roadside surveys contained in Appendix C, Alcohol and Highway Safety: A Review of the Literature and a Recommended Methodology. In the presentation and discussion, Appendix D, Scientific Roadside Surveys of Alcohol in the Driving Population, was used to supplement and expand the recommendations and research methodology.

4.3.1 Planning and Conducting the Roadside Survey

PROFESSOR M. W. PERRINE
University of Vermont
Burlington, Vermont

Professor Perrine reviewed the needs for roadside surveys; discussed various activities dealing with preliminary planning such as site selection, training of personnel and the selection of equipment; and, pointed out recommendations for conducting roadside surveys including safety considerations, stopping procedures, interviewing procedures and terminating the roadside operations.

Professor Perrine's discussions covered materials in the following references:

Appendix C: pages 50 through 67
Appendix D: pages 1 through 22

In addition, Professor Perrine referred to and recommended considerations contained in his study and report, Methodological Considerations in Conducting and Evaluating Roadside Research Surveys, U. S. Department of Transportation, NHTSA Technical Report, February, 1971.

4.3.2 Blood Alcohol Concentration Measurements

TOXICOLOGIST LOWELL C. VAN BERKOM
Minnesota Department of Public Safety
St. Paul, Minnesota

Toxicologist Van Berkom discussed materials dealing with BAC measurements contained in the following references:

Appendix C: pages 50 through 57
Appendix D: pages 22 through 24

In addition, slides were shown and materials distributed on several types of breath-testing instruments for roadside survey use, including:

<u>Stationary Quantitative Instruments</u>: These units are mounted permanently in a van and require that the driver be removed from his vehicle for breath sampling. Examples of this type displayed were: Breathalyzer Model 900A and Model 1000; Photoelectric Intoximeter; Gas chromatographic Intoximeter; Alco-Analyzer; and Intoxilyzer.

<u>Hand Held Quantitative Devices</u>: These units are sufficiently portable to allow the breath test to be conducted at car side, therefore, not requiring the removal of the driver from his vehicle. Examples displayed were: NHTSA Alcohol Screening Device; Alcolimeter; Alcolmeter; and ALERT units.

<u>Remote Collecting Devices</u>: These devices allow the breath sample to be collected at car side or in the van and store the sample for later analysis in a laboratory. It has the advantage of not providing immediate BAC results which alleviates some legal problems and can be a factor in reducing the percent refusal rate. Examples: Breathalyzer collection and transfer units and GC Intoximeter Indium Crimper.

The method of detection used in the various instruments presented were photometric; Hydrogen flame gas chromatograph; thermal conductivity gas chromatograph; Infra-red; Electrochemical oxidation and semi-conductor detectors.

The slide presentation was arranged in order of manufacturer to allow the participants to associate the various types of instruments as a group. The units displayed are listed below by manufacturer noting type of detector system and quality control units (simulators) where applicable:

<u>Smith & Wesson Electronics Company</u>
<u>Eatontown, New Jersey 07724</u>

Breathalyzer Model 900 - Photometric System Detector
Breathalyzer Model 900A - Photometric System Detector

Breathalyzer Model 100 - Photometric System Detector
Breathalyzer Collection & Transfer Units - uses calcium chloride tube for remote collection.
Simulator Mark IIA - constant temperature for quality control

Intoximeters, Inc.
St. Louis, Missouri 63103

Photoelectric Intoximeter - Photometric System Detector
Gas Chromatographic Intoximeter - Hydrogen Flame Detector
Nalco Gas Standard - Gas alcohol standard for quality control
Indium Crimper - uses indium tube for remote collection

Luckey Laboratories
San Bernardino, California 92404

Alco-analyzer - Gas chromatographic - thermal conductivity detector
Simulator - constant temperature for quality control

Omnicorn Systems Corporation
Palo Alto, California 94303

Intoxilyzer - Infra-red Detector

National Highway Traffic Safety Administration
Washington, D. C. 20590

Alcohol Screening Device - Electrochemical Oxidation (fuel cell) detector

Energetic Science, Inc.
New York, New York 10470

Alco-Limiter - Electrochemical Oxidation (fuel cell) detector

Lion Laboratories, Ltd.
Cardiff, Wales, Great Britain

Alcolmeter - Electrochemical oxidation (fuel cell) detector

Borg-Warner Corporation
Des Plaines, Illinois 60018

ALERT - Semi conductor detector

4.3.3 Breath-Testing Demonstration

Following the discussions with Professor Perrine and Toxicologist Van Berkom, demonstrations were made of the several breath-testing instruments available at the conference, including:

Breathalyzer
Alco-Limiter
Alcometer
Digital ALERT Unit

4.4 Demonstration of Roadside Surveys

Professor Perrine and Toxicologist Van Berkom reviewed the recommendations for roadside surveys and types and uses of breath-testing instruments on roadside surveys.

A special 25 minute film, developed by the National Safety Council conference team, was shown to illustrate some of the techniques and problems discussed in the conference reference materials. Emphasis was placed on how best to process and handle types of drivers interviewed at roadside surveys.

After a critique of the film, Professor Goldberg expressed thanks for the conference participants to the International Drivers' Behaviour Research Association and the National Safety Council for a successful conference on roadside surveys.

APPENDIX A

INTERNATIONAL CONFERENCE ON RESEARCH METHODOLOGY FOR ROADSIDE SURVEYS OF DRINKING DRIVING

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APPENDIX B

Demonstrators of Breath-Testing Instruments

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APPENDIX C

ALCOHOL AND HIGHWAY SAFETY:

A REVIEW OF THE LITERATURE

AND

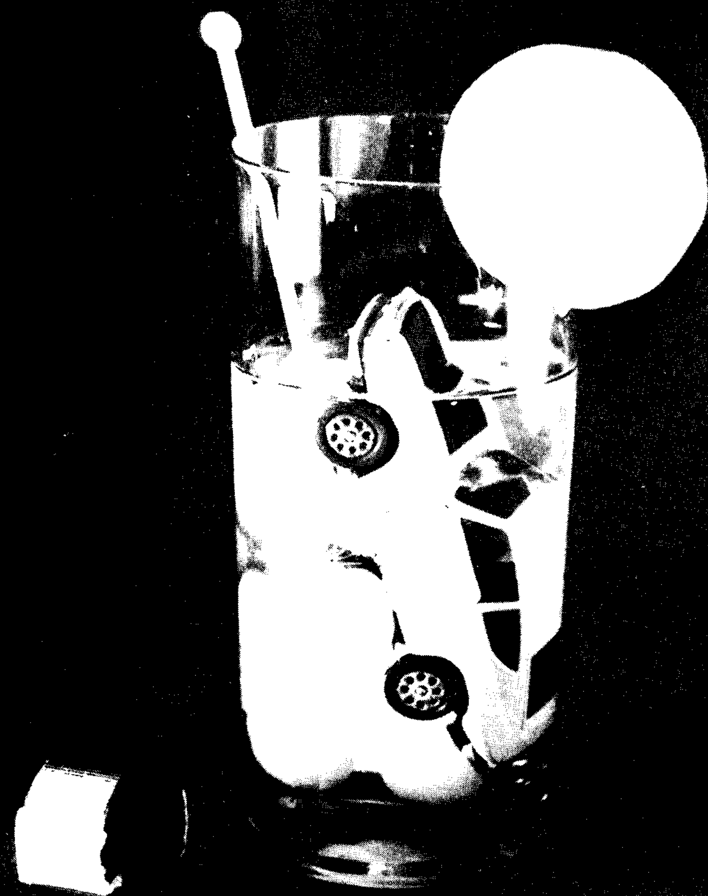
A RECOMMENDED METHODOLOGY

Road and Motor Vehicle Traffic Safety
Ministry of Transport
Canada

C-1

alcohol and highway safety.

A Review of the Literature and a Recommended Methodology



Transport Canada / Transports Canada

Road Safety / Securité routière

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alcohol and highway safety.

A Review of the Literature and a Recommended Methodology

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ALCOHOL AND HIGHWAY SAFETY

ROADSIDE SURVEYS OF DRINKING-DRIVING BEHAVIOR:

A Review of The Literature And A Recommended Methodology

This report presents the results of the work of a sub-committee, under the chairmanship of Dr. Carl. M. Stroh, of the organization for Economic Co-operation and Development Initiated Group of Experts, on the effects of Alcohol and Other Drugs on Driver Behaviour.

Road and Motor Vehicle Traffic Safety
Ministry of Transport
Canada

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INTRODUCTION

Many countries expend a considerable amount of time and energy in combating the drinking-driving problem. Some techniques appear to be moderately effective in diminishing the problem, while other techniques appear not to have any effect whatsoever. It would therefore seem wise to concentrate on those activities which appear to be the most effective, and discontinue support for those countermeasures which are found to be ineffective. The problem has been in deciding which countermeasures are effective, and which are not. In most cases, the data do not exist which will allow for decisions to be made regarding the effectiveness of the various countermeasures.

The few attempts that have been made to evaluate the impact of countermeasures have relied either upon questionnaire and interview data (which is dubiously correlated with behavioural data) or upon accident data (which is often confounded by a plethora of uncontrolled factors). What has been lacking is some sort of direct measure of the behaviour which is to be changed by the countermeasure.

Another, and related, problem is the question of the nature and extent of the drinking-driving problem in a particular country. Accurate information as to the type of person who combines driving with excessive drinking, the time of day, and the day of week when drinking-drivers are most prevalent, and other similar information would be most helpful in designing countermeasures' programs. Furthermore, it is only when an accurate picture of the number of impaired drivers on the road is available that it will be possible to evaluate the significance of findings related to the incidence of measureable BAC's in fatally injured drivers.

Finally, there is the problem of making comparisons between countries. It would be advantageous if it were possible to make international comparisons of both the drinking-driving problem and the effectiveness of the various national countermeasures' programs. Each country could save a considerable amount of time and money if the countermeasures' experience of other countries could be evaluated by some common yardstick. At the present time it is not possible to make these comparisons.

What is needed then is, (1) data for the evaluation of each new countermeasure, (2) data for the evaluation of complete countermeasures' programs, (3) data which will allow international comparisons of program effectiveness, and problem magnitude, and (4) data which will provide more information as to the nature and extent of the drinking-driving problem in each country. It would obviously be desirable if one single measure could be found which would serve all four needs.

The ultimate goal of all drinking-driving countermeasures is to reduce the number of accidents, injuries, and fatalities resulting from traffic crashes in which alcohol is a factor. In order to achieve this goal, most, if not all, countermeasures are directed at reducing the frequency of occurrence of high blood alcohol contents in the driving population. Therefore, the ideal measure of countermeasure effectiveness would be the actual change in the frequency of occurrence of high BAC's in the driving population. The obvious way to gather this information is to actually go out on the roads, pull the drivers over to the roadside, and obtain blood or breath samples from them.

Roadside sampling of the blood alcohol contents of passing motorists would give valuable information as to the nature and extent of the drinking-driving problem. Furthermore, if the data were to be gathered in the same way by all countries, it would allow for international comparisons of the extent of the problem and of the success of the various attempted solutions.

REVIEW

Evanston, Illinois

The first roadside survey of drivers' blood alcohol contents took place in Evanston, Illinois in 1938. R.L. Holcomb obtained 1,750 samples over a one week period by having the police randomly stop passing motorists and refer them to a testing team. Continuous testing was conducted from midnight on Friday, April 22 until 0600 hrs. on Monday, April 25, and then alternate day and night samples were collected until Saturday, April 30.

The survey was conducted at 8 locations, 4 of which were in areas where drinking-drivers were thought to be prevalent (proximity to liquor outlets), and the remaining 4 locations were in areas where drinking-drivers were thought not to be prevalent.

There were three survey crews, each consisting of three interviewer-testers (university students), a supervisor and a uniformed police officer. Each crew operated for 9 hours at a time.

A uniformed police officer stopped randomly selected cars whenever the survey crew was ready to process another subject. As soon as the car was stopped, an interviewer approached the driver and the police officer withdrew from the proximity of the vehicle. The driver was then asked a series of 6 questions (example - Are you bothered by headlight glare?) which were designed to elicit cooperation as well as to allow the driver to accommodate himself to the testing situation. The driver was then presented with a specially constructed wide-mouthed 'balloon', which he was asked to inflate. The breath sample thus obtained was then taken to the trailer laboratory where one of the testers immediately made a qualitative test on about 1,000 cc's of breath to see if alcohol was present. If alcohol was present, a quantitative analysis was made on the Harger Drunkometer.

The survey found that 12% of all drivers tested had been drinking, and 2% of all drivers tested had blood alcohol levels in excess of .10%. The obtained distribution of blood alcohol levels is presented in Fig. 1.

They found that people in the age range from 25-30 were the most likely to be drinking drivers. They also concluded that women drink and drive as much as men, when the number of women driving at the various hours of the day is considered. The study also found that most drinking was done on the weekend, the largest number of drinking drivers being detected during the early hours of Sunday morning.

Toronto, Ontario

The next survey on record took place in Toronto, Ontario during 1951-52. A research team headed by G.H. Lucas gathered samples from non-accident involved drivers who were at the accident scene at the same time, travelling in the same direction, and in cars of the same vintage as were accident involved drivers. Samples were obtained for 2,015 non-accident involved drivers.

Breath samples were collected in plastic balloons and analyzed later on either a Harger Drunkometer or a Greenberg Alcometer. Each driver was asked four questions and then given a questionnaire which was to be returned by mail to the researchers. The results indicated that 8.7% of the drivers tested had BAC's of .10% or greater. The distribution of blood alcohol levels is presented in Fig. 2.

Bratislava, Czechoslovakia

In West Bratislava and its nearby suburbs, in 1956-57, an investigation was launched to determine the number of drinking drivers on the roads at night between 2200 and 0300 hrs. and during the day between 0600 and 2000 hrs.

Following a preliminary investigation by the Road Safety Department to determine where surveys could be carried out without causing much waiting or serious economic losses, the first location was set up. One of the main roads of Bratislava-Raca (a suburb of Bratislava) was chosen for a night-time survey. Approximately 25 cars an hour pass through on this route. The entire investigation was kept secret. The method of investigation was as follows: All vehicles were stopped by a patrol who checked drivers' licences and then requested drivers to take a medical examination. Then the Hargersch test and blood test were performed to determine the presence of alcohol. If the driver was found to be intoxicated, he was given a ride home by the relief driver. This procedure had to be stopped after awhile because of the great percentage who were found to be "under the influence". Each examination and test required about 13 minutes. If, in some cases, a positive alcohol reaction was given, the Widmark method was also used to determine the amount of alcohol present.

The first test took place on Saturday night, in order to involve a small amount of vehicles. The second was conducted on Tuesday night between 2200 and 0300 hrs. These two surveys resulted in 43 and 70 subjects being tested (a total of 113), 49.5% of which were "under the influence of alcohol". All but 18 of the 113 subjects said they had taken a drink within the previous 12 hours. Of those 56 "under the influence" (at least .05% of alcohol in the blood), 63% had BAC's of between .05 and .10 percent, and 21% had BAC's of between .10 and .15 percent. The remaining 16% (nine in number) were over .15 per cent. Later analysis showed that this area had in the past had a greater number of traffic violations and speeding offences. This raises some questions as to the validity of generalizing from this sample.

In addition to these night surveys, a daytime survey was carried out in Bratislava. A day's investigation lasted from 1300 to 1900 hrs. without a break. The procedure followed in Bratislava was the same as that used in the preceeding two nightime surveys but only drivers of government owned vehicles were included as the traffic density was too great to include all drivers. In all, seventy drivers were tested, and 8 (11.2%) were found to be "under the influence" (registering between .09 - .19 per cent BAC.).

A third investigation, conducted in the area around Bratislava between 0600 and 200 hrs. daily included over 2,000 drivers. Because of suspected sampling bias, a majority of the drivers were disregarded, leaving 348 drivers on which to base the results. All drivers were stopped at each site, a total of six sites were covered each day, encompasing 100 to 200 kilometers a day. The length of time required to complete this survey is not clear from the translation. This daytime investigation revealed that of 348 drivers, forty (or 11.4%) had between .06 and .22 per cent alcohol in their blood.

No attempt was made to match driver alcohol level with demographic variables such as sex, age, education, or occupation.

New York City

The researchers collected case data on motor vehicle fatalities in New York City (excluding Staten Island) for the periods June 1 to October 24 in both 1959 and 1960. Their accident data were based on files of the Office of the Chief Medical Examiner of New York City and the Accident Investigation Squad, New York City Police Department. It was decided to use only those accident fatalities which had died within six hours of the accident. This was done to avoid, as much as possible, loss of alcohol concentration prior to autopsy.

The sites of these fatal accidents were then revisited on the same day of the week and at the same time of day for the purpose of obtaining data from non-accident involved drivers. They were chosen, without reference to probable weather, within a few weeks of the calendar date of the occurrence of the accident.

A typical site team consisted of one or both of the authors, one to eight policemen, and an unspecified number of medical students. Only non-commercial passenger motor vehicles were involved in this survey. A random manner of selection was used: on arrival at the site a number from 1 to 20 was chosen, and subsequently every nth car was stopped. The direction of traffic surveyed was the same as that in which the accident victim had been travelling. A total of six successful interviews and breath specimens was the objective for each site. When the site had a low traffic density then n chosen was 1 and the first 6 cars were stopped. It is not stated exactly what role the police played in the survey, nor is it stated who interviewed the Subjects and who took the breath test. Participation of the driver was voluntary and anonymous.

Refusal rate was minimal, only 1 Subject of 222 refused to provide an interview and breath specimen. A total of 37 sites were visited, each resulting in 6 complete interviews and breath tests, for a total sample size of 222. Actually, an additional 36 subjects were tested at sites where the accident victim lived longer than six hours, but these subjects are not included in these data.

The breath specimens were collected in Saran bags (developed by the Department of Pharmacology, University of Toronto). The breath samples were analysed approximately 2 to 3 hours later by the following method: On returning to the lab the Saran bags were placed in an incubator at approximately 40°C. for about 15 minutes. The Breathalyzer was used to analyse the incubated breath samples.

Although the author's purpose in conducting the survey was to determine (by comparing normal driving population to accident fatalities) the cause of fatalities in the driving population, this review of studies to determine the extent of drinking drivers in the normal population will only deal with the data relevant to the controls.

Fifty-two (23%) of the drivers had measurable BAC's, and nine (4%) had BAC's of .10% or greater. The distribution of blood alcohol levels is presented in Fig. 3.

No significant association between socio-economic status and alcohol concentration was found to exist.

Grand Rapids, Michigan

What is perhaps the most referenced study in this area was conducted in Grand Rapids, Michigan during 1962-63, by a research group headed by R. Borkenstein. A total of 7,590 non-accident involved drivers were interviewed at the sites of previous accidents, at the same time as the accidents had occurred.

Randomly selected vehicles were directed into the survey site by a police officer. Breath samples were collected in specially designed polyethelyne bags and returned to the laboratory for later analysis on the Breathalyzer. Four samples were collected at each site.

10.9% of the population were found to have measurable BAC's, and 2.4% of the drivers were over .05% BAC. The distribution of blood alcohol levels is presented in Fig. 4.

The 25-34 year olds were found to have the highest percentage of drivers with BAC's at .08% or over. Drivers who were either younger than 17 or older than 65 were the least likely to have high blood alcohol contents.

Married people were found to be less likely to be drinking drivers than were either separated or divorced people. Education was found to be a factor not only in determing whether or not a person would be drinking and driving, but also whether or not the person would refuse to take the breath test.

Those who drive less than 5,000 miles a year were less likely than those that drive 5,000 or more miles a year, to be drinking drivers. It was also found that at BAC levels of .05% and above, the non-white drivers were over-represented.

Howard County

A second, and as yet unpublished, survey was conducted by Borkenstein et al in 1967, throughout Howard County, Indiana.

The county was divided into 8,400 1,000-foot squares. The types of road (4-lane, 2-lane, county, city) within each square "were identified and a numerical designator was assigned which identified the square, the type of road, and the road itself. The roads were then listed by type. This resulted in 165 four-lane segments, 392 state and federal two-lane segments, 1979 city street segments, and 3760 county road segments. Using a table of random numbers, 1,000 sites were selected from the lists. In actuality this selection identified only a segment of a road within a 1,000 foot square area. Actual site selection was done by the field researchers following a physical inspection of the road segment."

Breath samples were obtained by having subjects provide 52.5 ml. of deep-lung breath to a tube of calcium chloride. These tubes were then returned to the laboratory, where they were heated and had the alcohol removed by forcing hot air through them. Quantitative analysis was then done on the Breathalyser.

Vehicles (excepting commercial transportation and large trucks) were stopped by the police, who then introduced the survey to the drivers, and requested their participation. Interviews were conducted by the civilian personnel.

Although detailed results were not available at the time of writing this review, apparently 74 (4%) of the 1,800 drivers tested had blood alcohol levels of .05% or above.

France

Approximately 7,300 samples were collected throughout France during 15 five-day periods in the six-month period extending from June to November of 1969. Samples were collected during three 1 1/2 hour time segments on each of the chosen days, with the proviso that during each one-week period, 13 day samples and 2 night samples would be gathered.

Breath samples were analyzed on the Breathalyzer, and information was gathered from each subject as to his age, sex, profession, etc.

The results indicated that approximately 52% of those drivers sampled had been drinking. The distribution of blood alcohol levels is presented in Fig. 5. It was found that people in the age range from 35-54 years were the most likely to be drinking-drivers, while those people under 25 and over 65 were the least likely to be drinking-drivers.

Men were found to be more likely to be drinking and driving than were women.

Drinking-drivers were found to be most common on Saturdays.

The group with the smallest representation in the high BAC categories were the students, professionals, and engineers. There were three groups with no representation in the high BAC levels: these were housewives, artists and clergy.

Separated and divorced individuals were more often found to be in the high BAC range than were married people.

It was further observed that the greatest percentage of heavy drinkers was found in the country town areas.

Burlington, Vermont

Also in 1969, a project was conducted in Burlington, Vermont by W. Perrine, J. Waller, and L. Harris. Data were gathered on 1,184 persons. Road-blocks were set up at the sites of fatal crashes on the same day of the week and at the same time of day, within a few weeks of the crash occurrence (during the first year of the study), or on the anniversary day (during the following year of the study). Six interviews were obtained at each survey site from motorists who were travelling in the same direction as the crash involved driver had been travelling.

The police stopped a car whenever a survey team was ready to interview another driver.

Breath samples were analyzed on the Mobat Sobermeter during the first phase of the study, and on a Borkenstein Breathalyzer during the next phase of the study.

14% of the drivers sampled had BAC's of .02% or higher and 3% of the drivers had BAC's of .10% or higher. The distribution of BAC's is presented in Fig. 6.

Delhi

"In a preliminary study conducted in Delhi during night hours to determine the extent of drunkenness in drivers, breath samples of drivers of all types of vehicles were collected and tested in a specially equipped mobile laboratory. Other information on these drivers, such as age, driving experience, education and marital status was also obtained." The main conclusions were "(1) many drivers, especially those of heavy vehicles are habitual drinkers, (2) drunkenness is more prevalent in less educated drivers, and (3) age and number of dependents have some effect on drinking habits of drivers."

This study was apparently conducted during 1969, but that date is not definite since the original report was not available to the author of the present review.

Netherlands, 1970

During the Dutch survey of 1970, complete data were gathered on 2,675 subjects. Testing was carried out from 2200 to 0400 hrs. on Friday, Saturday and Sunday during September, October and November at 3 sites in each of 38 different towns. Each team consisted of two police officers, one medical doctor, two interviewers, one breath tester, one person to introduce the drivers to the research team, and one supervisor.

Of the 3,141 people who were stopped, 451 refused to cooperate, and incomplete data were gathered on some others.

The police stopped one car every 8 minutes. The agreement was that if the police suspected a person of drunken driving the person would not be taken to the van but rather to the police station. In fact this never happened.

If the results of the testing suggested that the person was not fit to drive, he was offered a ride home. Approximately 60 people were driven home or given taxis. If the people refused this offer, the police would take the keys to the car for the evening.

Each subject took about 15 minutes to complete the procedure. During this time a blood sample, two breath samples and an interview were conducted.

The results indicated that approximately 27% of the drivers surveyed had been drinking (BAC's of .01% or higher). The BAC distribution is presented in Fig. 7.

Netherlands, 1971

A second Dutch survey was conducted in 1971. This study was a replication of the earlier study, and obtained completed data in the same manner from 2,967 subjects. In all, 3,417 drivers were asked to participate, and 434 of these refused to cooperate. The results of this survey indicated that approximately 34% of drivers had been drinking. The BAC distribution is presented in Fig. 8.

Norway

A roadside survey was conducted in Norway during 1970-71. Checkpoints were set up in various areas between 2200 to 0200 hrs. Police stopped every nth driver and asked them to consent to undergo the test. This was voluntary and the subject was assured that no legal consequence would ensue if he chose not to take the test (providing that there were no clinical reasons to suspect that he had been drinking).

A total of 1,946 drivers were stopped, and of these, 1,927 consented to take the test. Breath samples were analyzed by means of the Alcotest. In the case of suspected intoxication, a blood sample was taken and sent for analysis. The distribution of blood alcohol levels is presented in Fig. 9.

Canberra

A pilot roadside survey was conducted in Canberra, Australia during February of 1971. A total of 190 drivers were interviewed over seven consecutive days between 2200 to 0200 hrs.

The details of this pilot project are not available, but based on the results, it was decided to proceed with a major survey.

Mecklenburg County

Several studies have recently been initiated in the United States as part of the Department of Transportation's Alcohol Safety Action Programs. In the Mecklenburg County (North Carolina) study, data were collected from two hour periods at 27 sites on 9 consecutive nights. The sites were operative during the time segments 1900 to 2100 hrs, 2200 to 2400 hrs, 0100 to 0300 hrs. Breath samples were obtained from a total of 766 subjects (92% volunteer rate).

The BAC distribution is presented in Fig. 10. Four percent of the subjects were found to have BAC's of .10% or greater.

The greatest number of drinking-drivers were found to be on the road between the hours of 0100 to 0300 hrs. The group of people least likely to be driving with high blood alcohol contents were the 16 to 19 year olds. The worst group were the 31-40 year olds. Males were over-represented in the drinking-driving population.

Washtenaw County

In the Washtenaw County (Michigan) study, "data" were collected for two hour periods at 48 sites on 16 separate nights over a four-week period. Once again, the sites were operative during the time segments 1900 to 2100 hrs, 2200 to 2400 hrs, and 0100 to 0300 hrs. Breath samples were obtained from a total of 746 subjects (volunteer rate of 87%). Approximately 10% of the drivers had BAC's of .05% or above, and 4% of the drivers had BAC's of .10% or greater. The BAC distribution is presented in Fig. 11.

The 16 to 19 year olds had the lowest percentage of drinking-drivers. The 31 to 40 year olds had the highest percentage of drinking-drivers. Once again, males were over-represented.

Drivers with high BAC's tend to be on the roads during the early morning hours, (0100 to 0300 hrs.), and tend to drive on low volume roads.

Housewives, retired and unemployed people have the least number of people in the medium BAC ranges (.05-.09%). At high BAC levels, students have the least representation, and labourers and people in the "operative" category have the greatest representation.

Separated and divorced people were found to be over-represented in the night-time drinking-driving population.

Albuquerque - Bernalillo County

A more recent survey has just been completed in Albuquerque - Bernalillo County in the U.S. Samples were gathered during three two-hour time periods between 7 p.m. and 3 a.m. during 4 days in May of 1971. A total of 921 drivers were stopped and complete information was obtained for 863 of these.

Samples were collected from 24 different locations. Drivers were interviewed at the wheel by a team consisting of one field supervisor, 4 traffic officers, 2 supervisors and 2 interviewers. Two teams were employed.

Breath samples were collected by means of a crimper box with indium tubing (intoximeters). Gas chromotography analyses were carried out subsequent to completion of all roadside procedures. The distribution of blood alcohol levels is presented in Fig. 12. 28.6% of all drivers interviewed had BAC's of .01% or greater, and 8.8% had BAC's of .10% or greater.

The age group 20-29 had the highest representation at the high BAC levels. More females than males were found to have been drinking, although males were over-represented in the high BAC's levels.

Drivers with BAC's of above .15% were either alone or with only one passenger.

Alberta

The Canadian Ministry of Transport has recently completed three surveys. The first survey was conducted in the province of Alberta between the hours of 2100 and 0300 hrs. on 16 nearly consecutive days in the month of August, 1971.

The survey was conducted by two independent teams, each working at one site per night (a total of 20 sites, some of which were visited twice.)

Royal Canadian Mounted Police stopped all cars passing through the checkpoints, and conducted a routine traffic safety check. During the course of these safety checks, all suspected drinking drivers were apprehended and removed from the sample.*

Those drivers who were not apprehended were passed on to the survey crew, which was composed of a flagman, two interviewers, and two Breathalyzer operators.

A total of 2,022 drivers were asked to take part in the study, and of these, 125 (6%) refused to participate. 26% of those people who were tested were found to have been drinking, and 6.1% were over the legal limit of .08% (80 milligrams per 100 millimeters). The BAC distribution is presented in Fig. 13.

For those drivers who had at least one prior conviction for impaired driving, the likelihood of their having been drinking was twice as great as for those people who had not had prior convictions.

Salary itself seemed to have little effect on drinking-driving behaviour.

People who were taking prescription medication were less likely to have been drinking or to be over the legal limit.

* Thirty-four drivers were charged with impaired driving.

New Brunswick

A second Canadian study was conducted in the province of New Brunswick on ten consecutive days from November 6 to 15 of 1971. Four teams each worked a six-hour shift every day. In this way, data were gathered on a 24-hour a day basis.

Once again, Royal Canadian Mounted Police stopped all cars passing through the checkpoints and conducted a routine traffic safety check. Suspected impaired drivers were apprehended by the police and thus removed from the sample.*

Completed data were obtained on 1,556 drivers. Unfortunately the data were invalidated because of an extreme sampling bias.

Edmonton - Calgary

A third study was conducted in the cities of Edmonton and Calgary in December of 1971 and January 1972, in conjunction with a public education campaign that was run during December. There were two research teams, one in Calgary (control city), and one in Edmonton (experimental city), each consisting of two testers, four interviewers, one flagman, and two policemen. Each team operated between 1900 and 0200 hrs. on Thursday, Friday and Saturday nights (November 25 to 27, December 2 to 4, January 6 to 8, 13 to 15). The same six sites were visited before the campaign and after the campaign in each town.

Subjects were first given a Lucky Drinkometer, then all those subjects who scored positive on the Drinkometer were given a Breathalyzer.

The police officer did not speak with the driver, he merely waved the driver into the survey site.

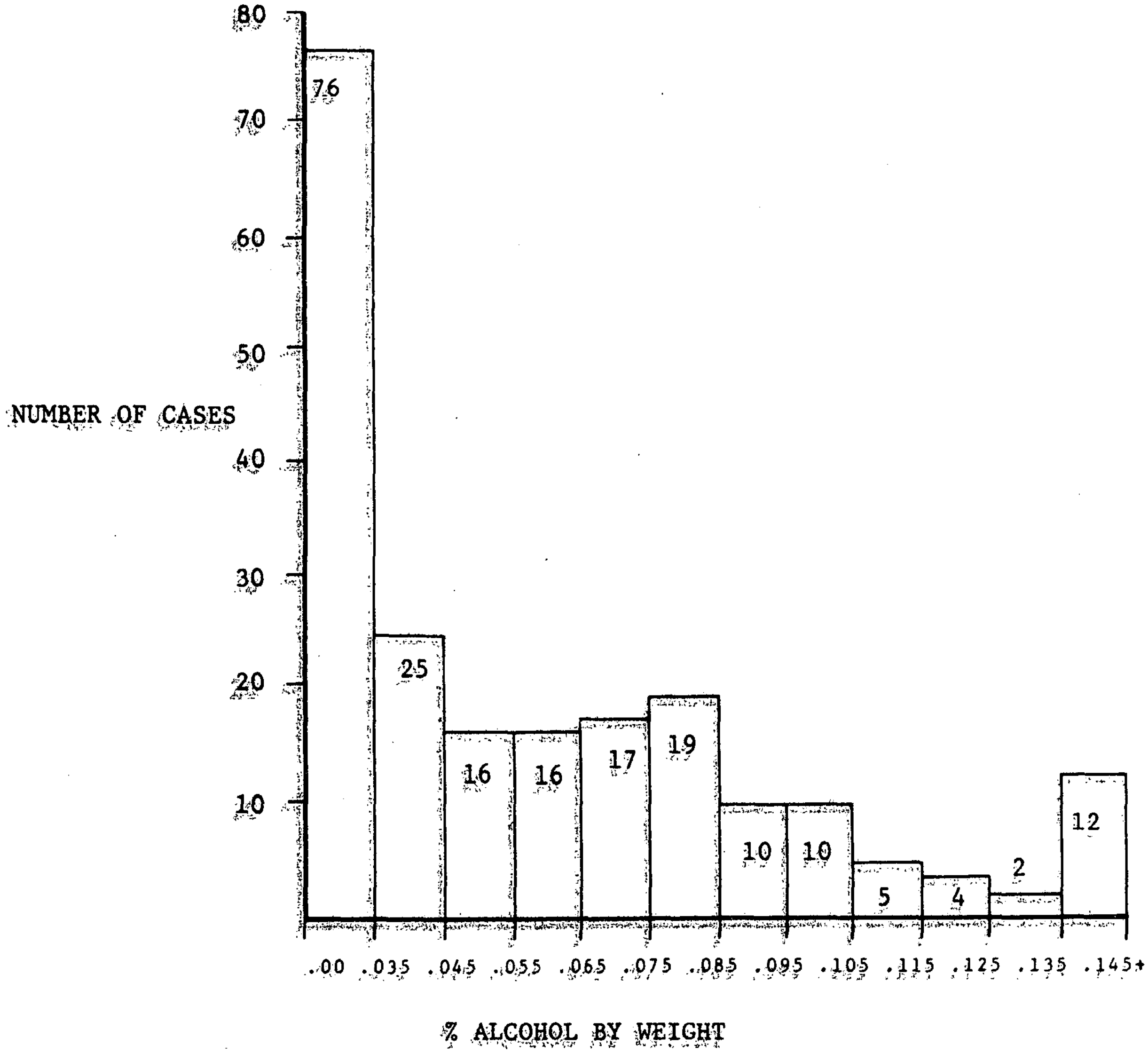
A total of 10,313 drivers took part in this study. Of these, 7.9% had been drinking, and 2.1% were over the legal limit of 0.08% (see Fig. 14). In interpreting these figures, it must be remembered that many drinking-drivers, particularly those with low BAC's were probably not detected by the Drinkometer, and thus were not given Breathalyzer tests. These figures, therefore, are probably an underestimate of the true problem.

A significant reduction in the number of drinking and impaired drivers was observed in the experimental city but not in the control city.

* Ten drivers were charged with impaired driving.

A brief comparison of thirteen of these studies is presented in Table I.

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - ILLINOIS 1938



An additional 1538 drivers had BACS of .00

FIGURE 1

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - ONTARIO 1951

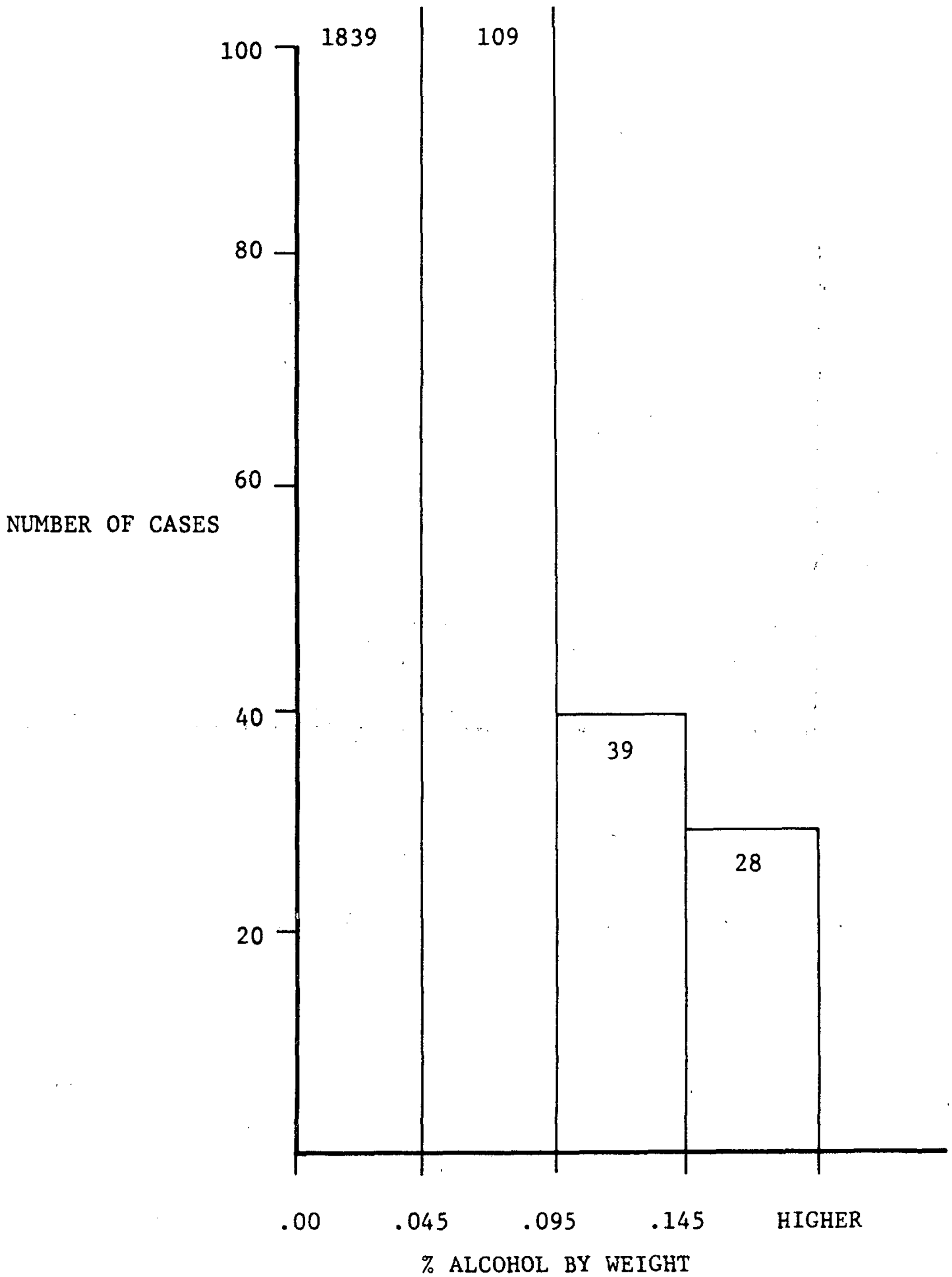
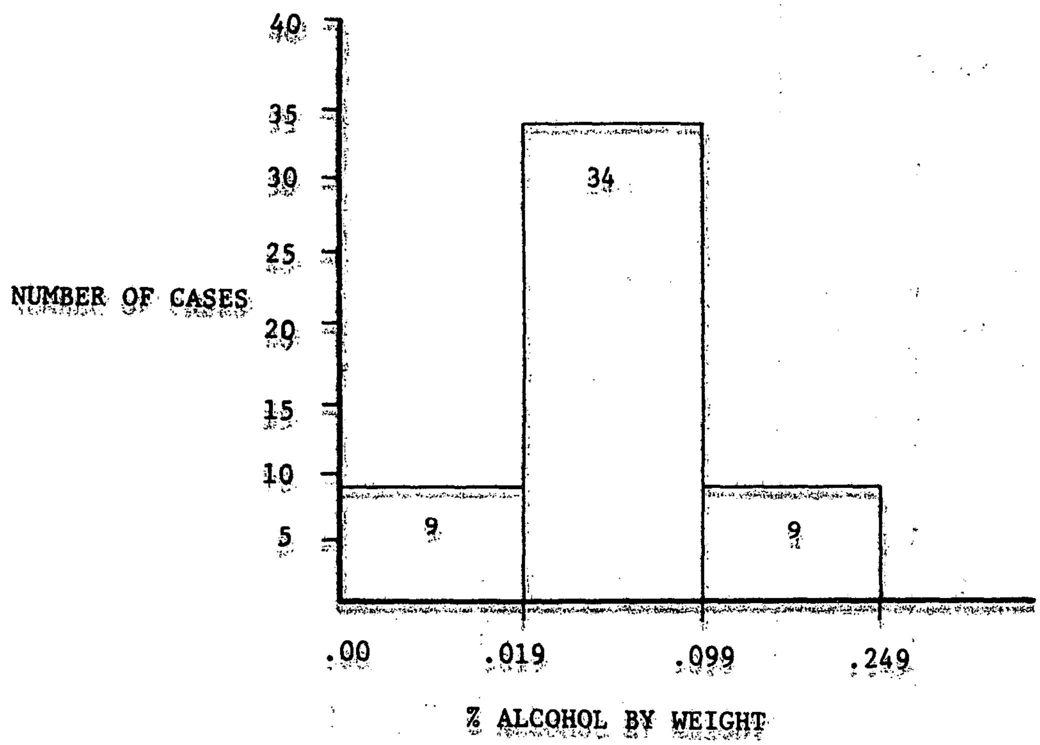


FIGURE 2

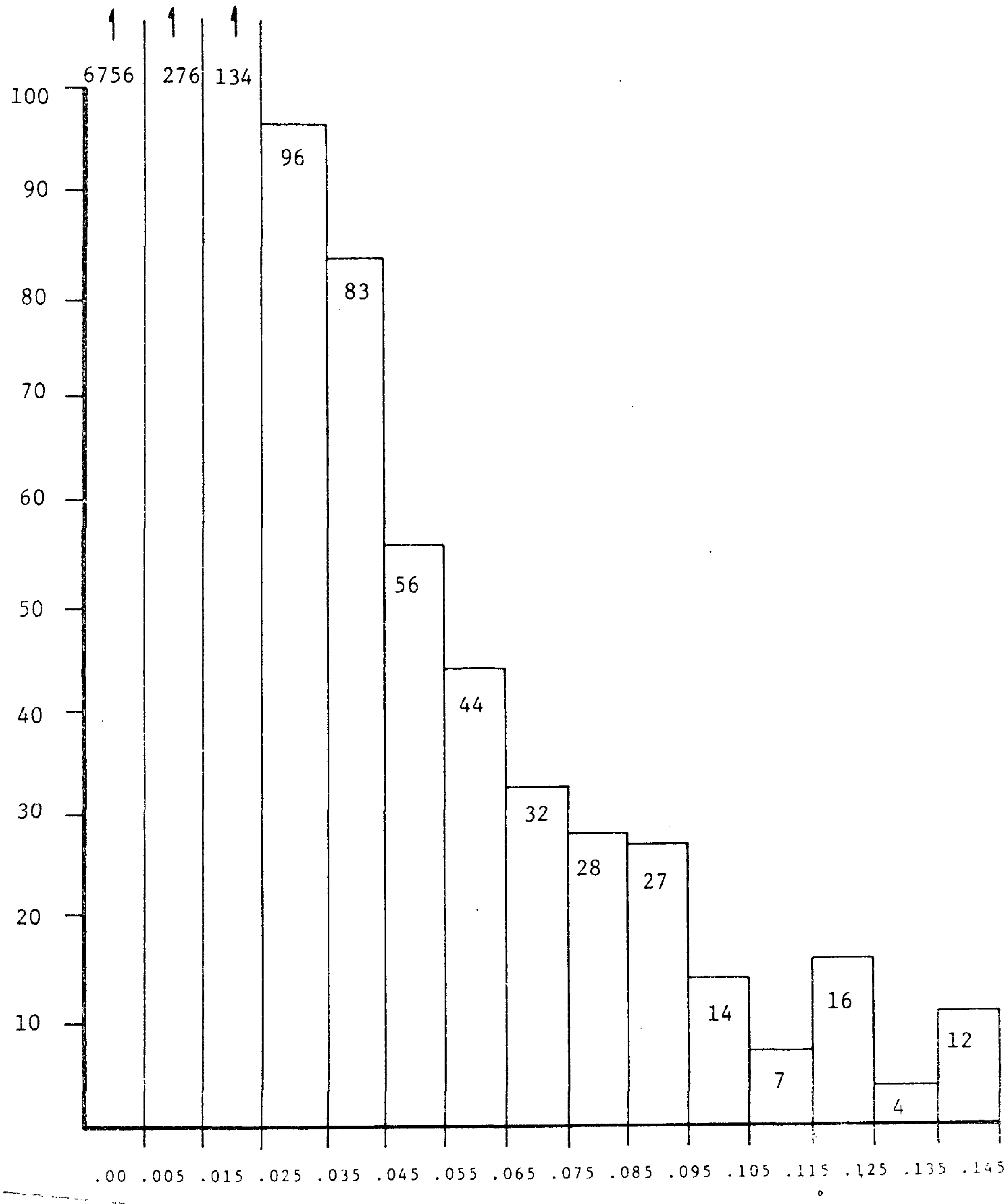
DISTRIBUTION OF BLOOD ALCOHOL LEVELS - NEW YORK CITY 1960



An additional 165 subjects had BACs of .00%.

FIGURE 3

DISTRIBUTION OF BLOOD ALCOHOL LEVELS- MICHIGAN 1962



BAC Data are Provided for 7585 of the 7590 Interviewed.

FIGURE 4

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - FRANCE 1969

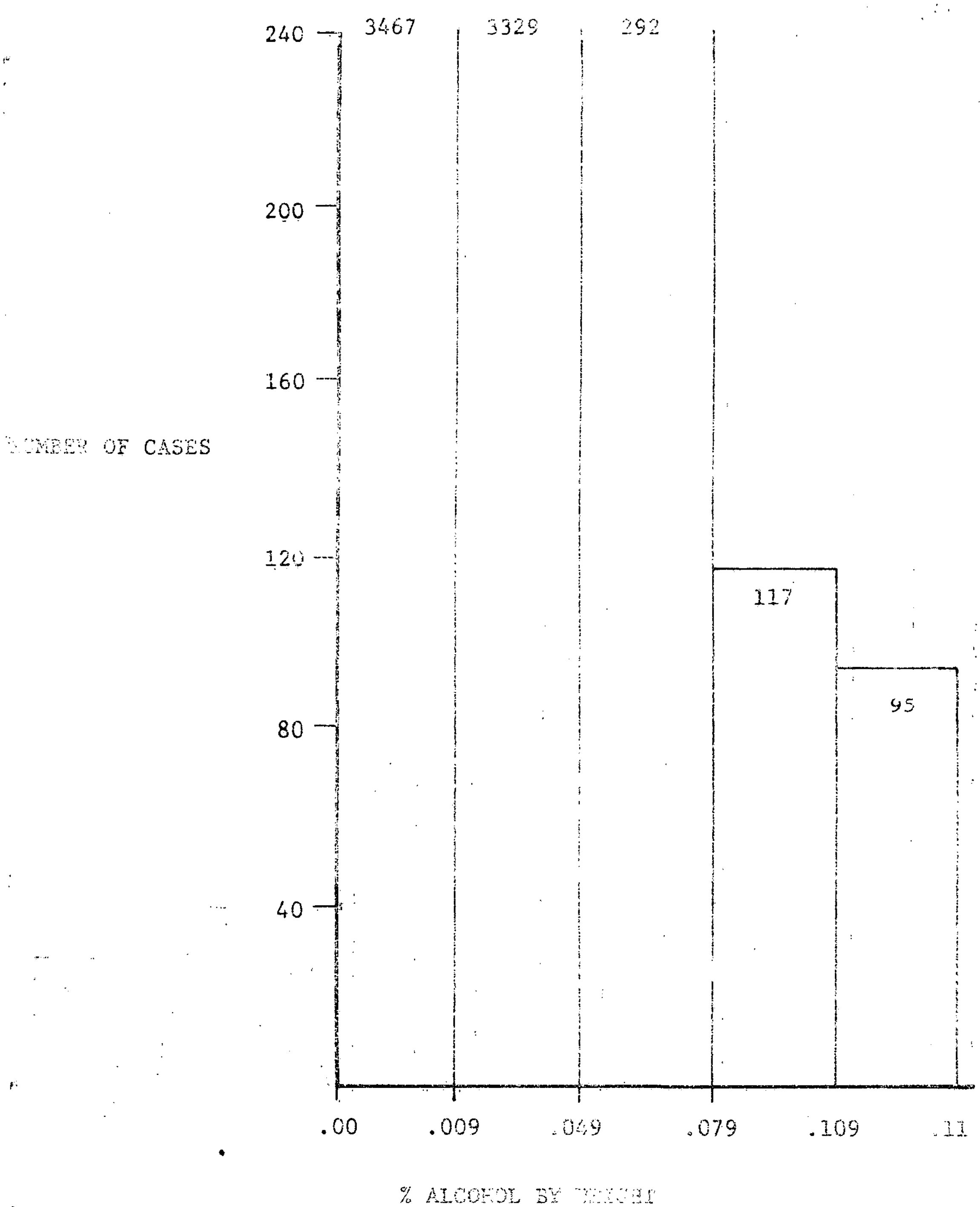
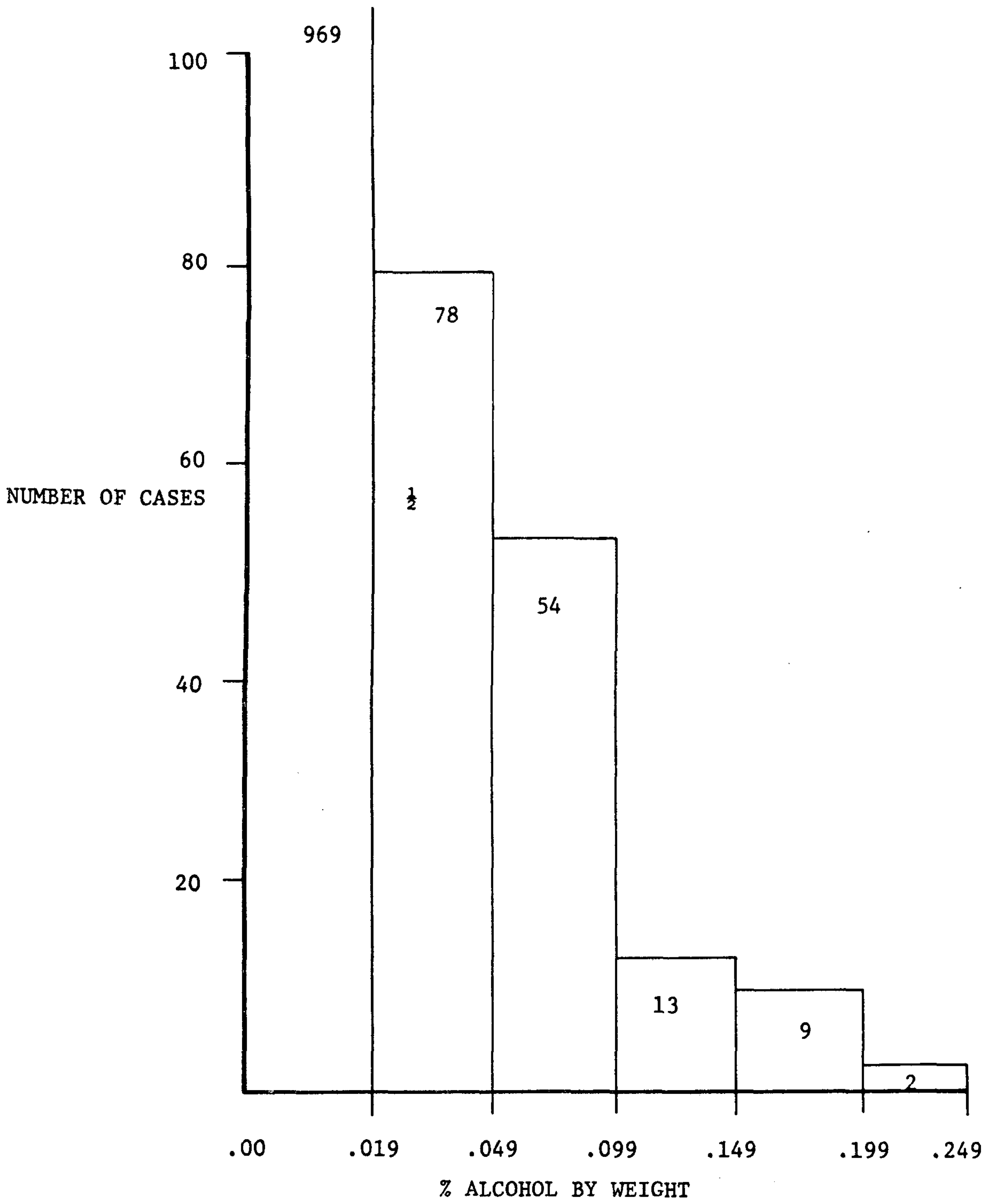


FIGURE 5

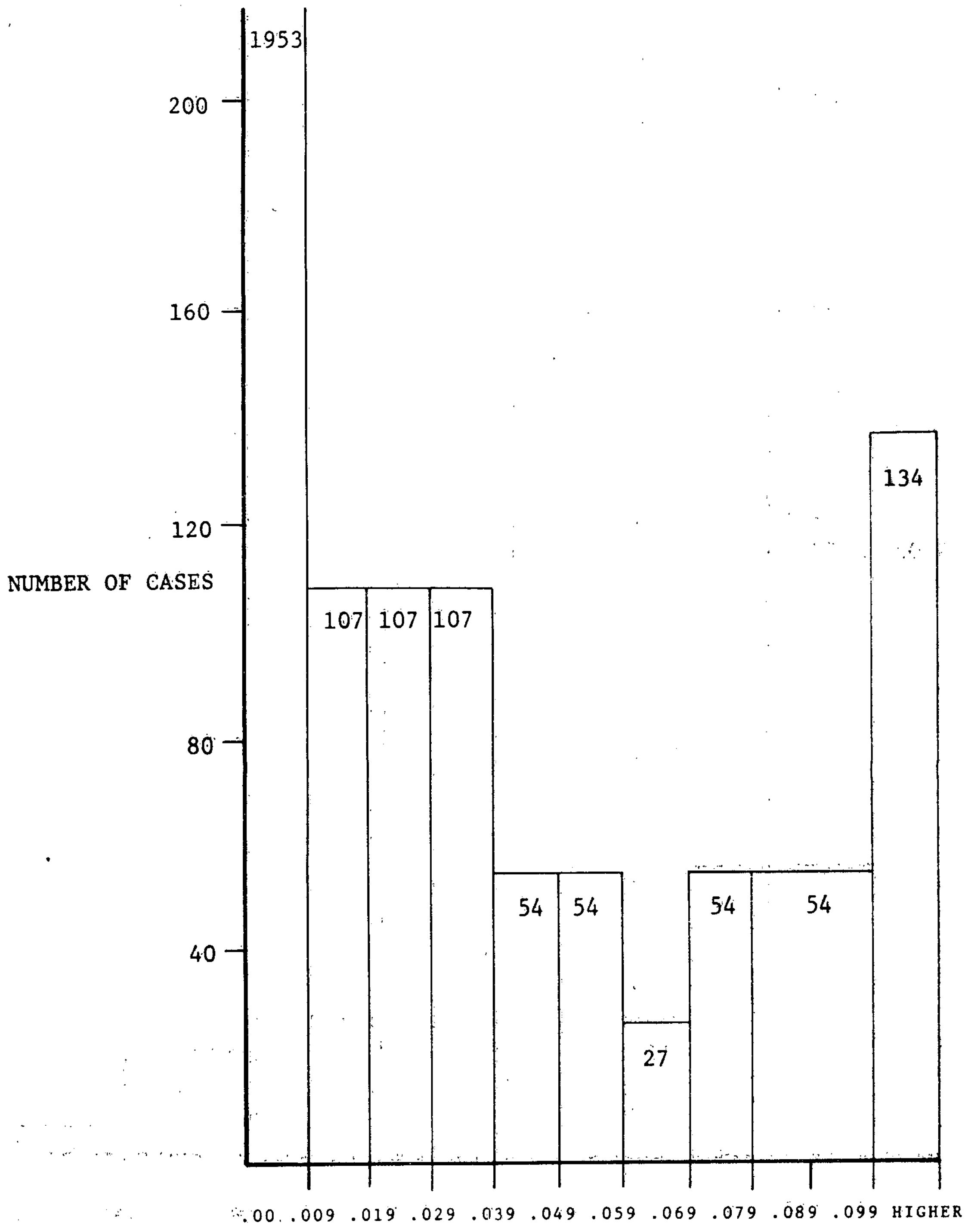
DISTRIBUTION OF BLOOD ALCOHOL LEVELS - VERMONT 1969



The BACS of 59 drivers were unknown.

FIGURE 6

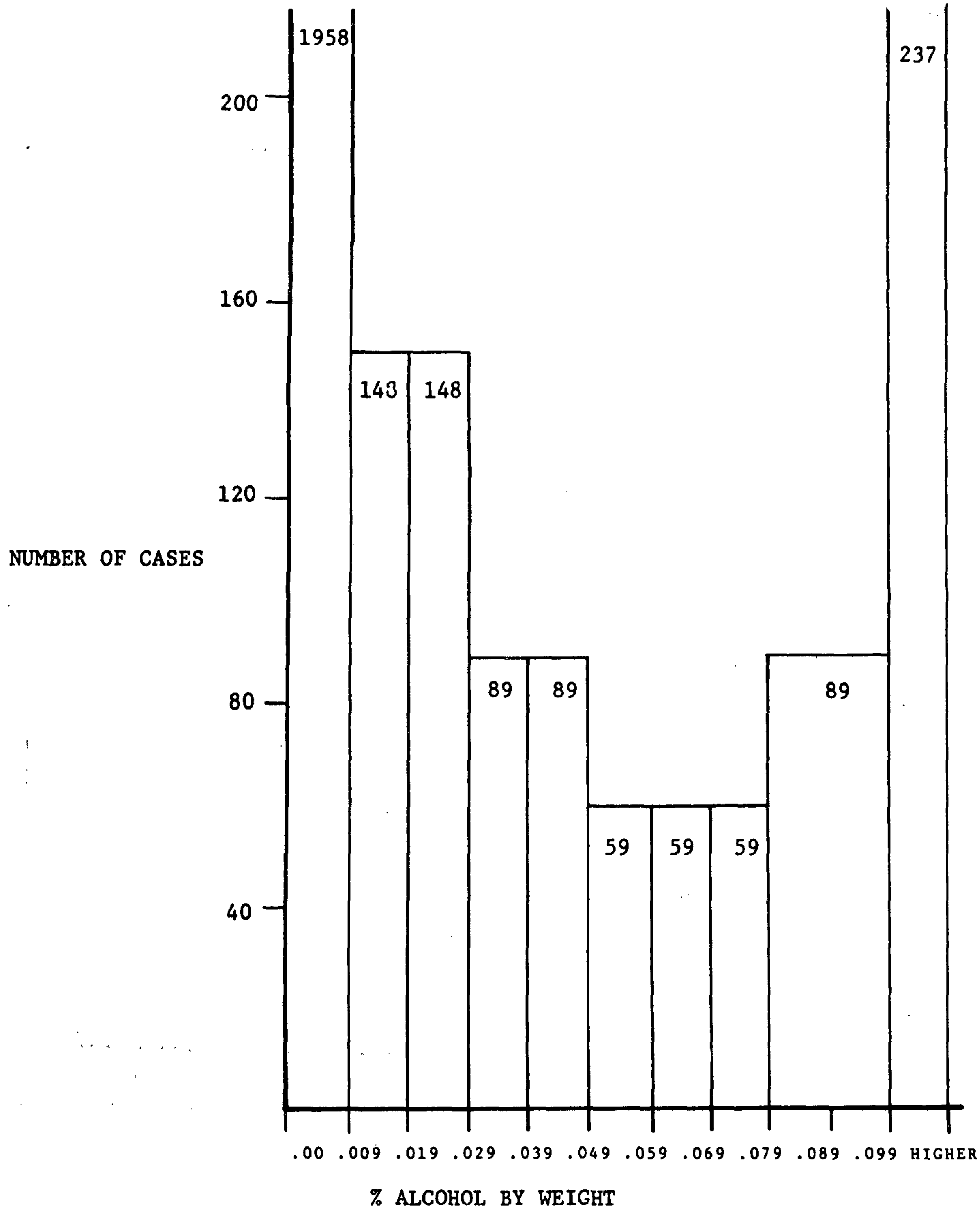
DISTRIBUTION OF BLOOD ALCOHOL LEVELS - NETHERLANDS 1970



Data on 24 Ss. was not available at the time of this report.

FIGURE 7

DISTRIBUTION OF BLOOD ALCOHOL - NETHERLANDS 1971



Data on 32 Ss was not available at the time of this report.

FIGURE 8

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - NORWAY 1971

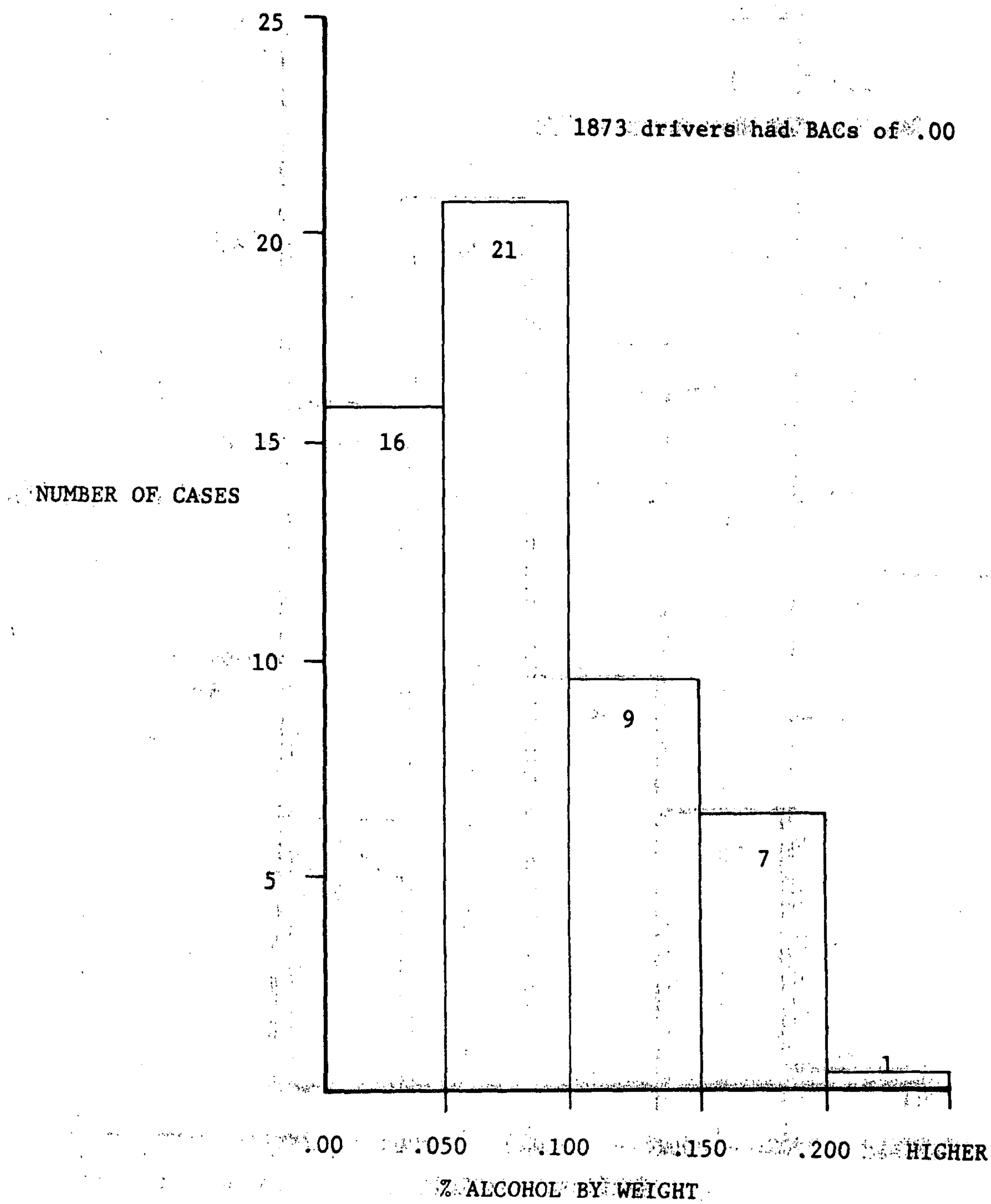


FIGURE 9

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - NORTH CAROLINA 1971

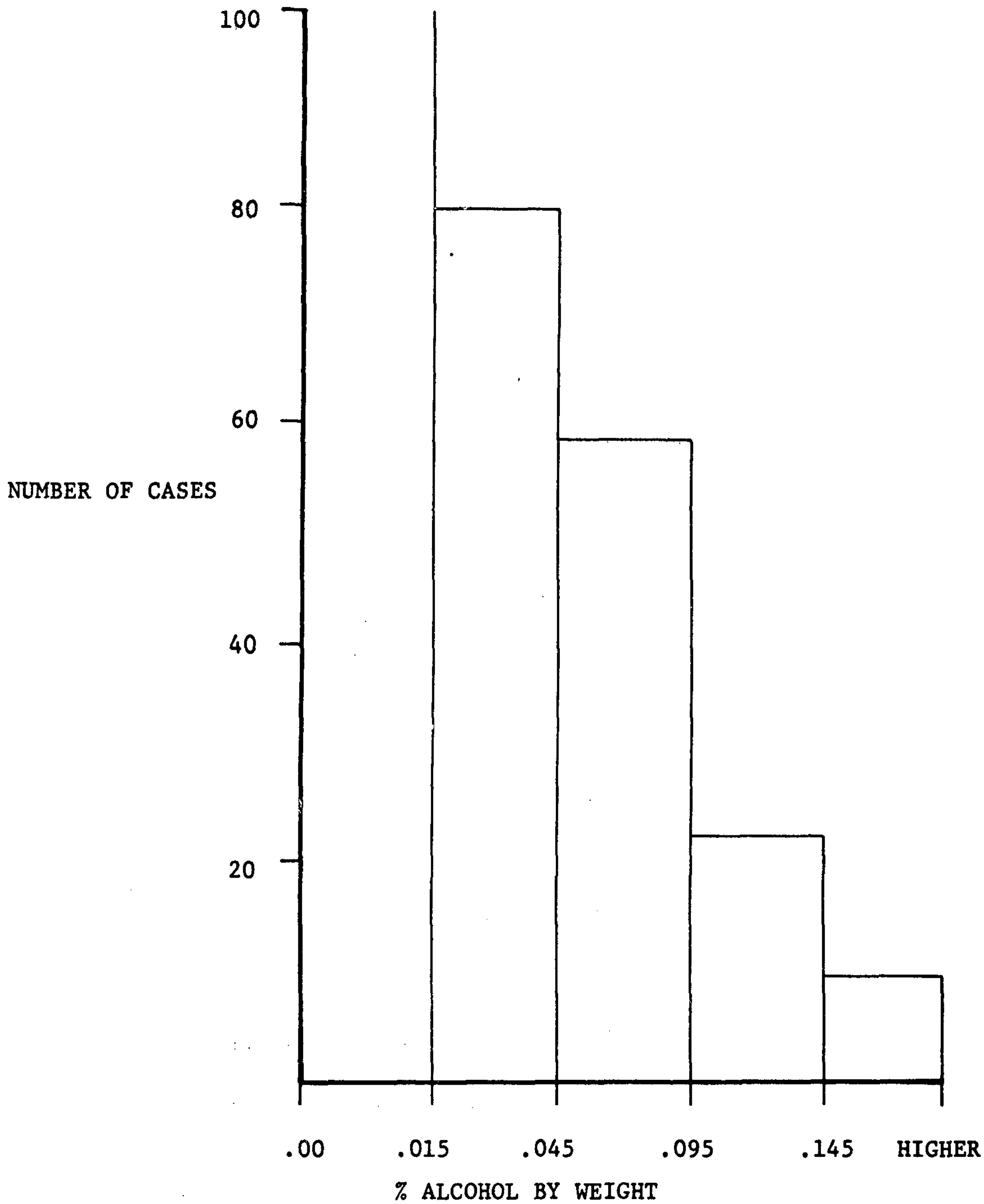


FIGURE 10

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - MICHIGAN 1971

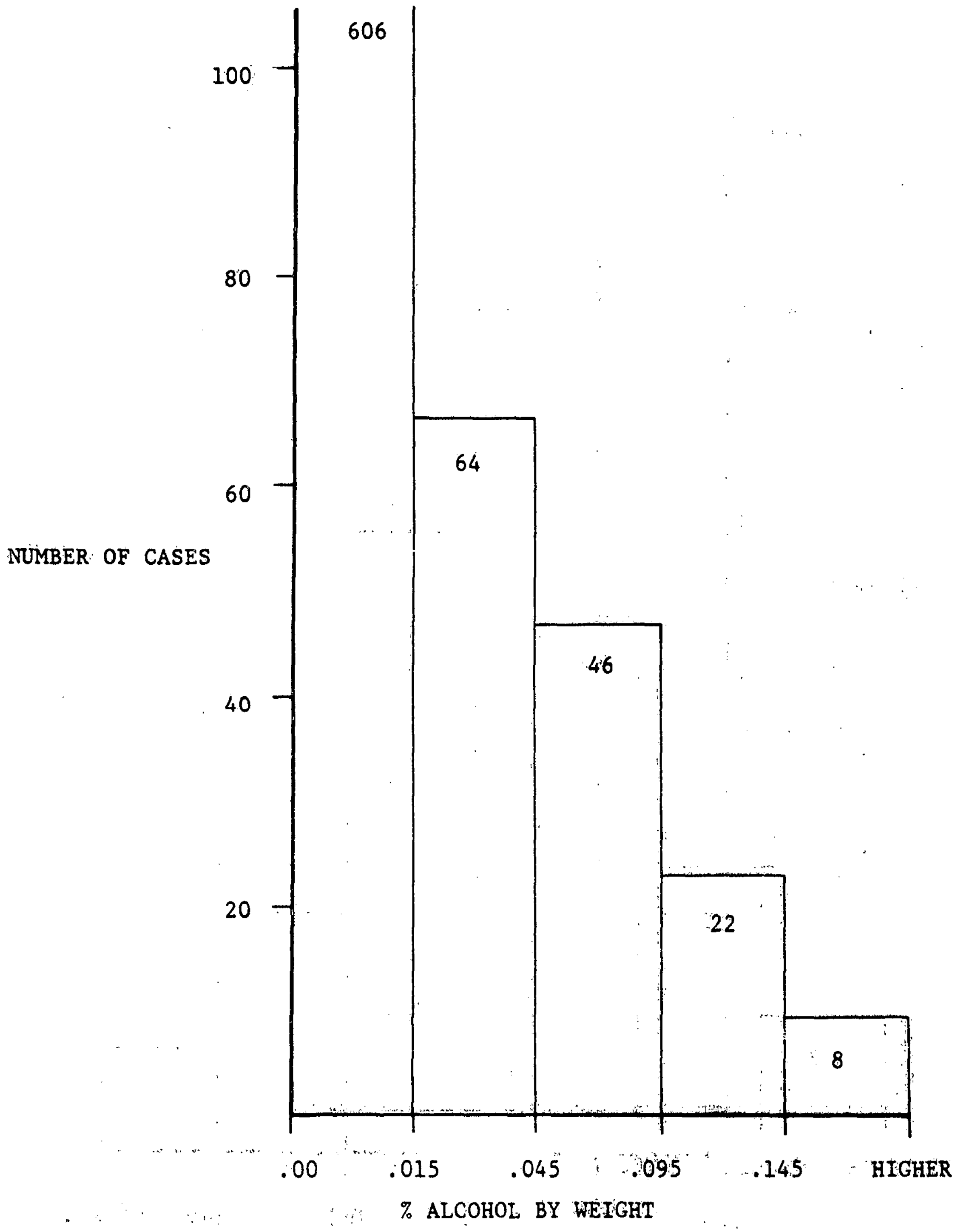


FIGURE 11

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - ALBUQUERQUE 1971

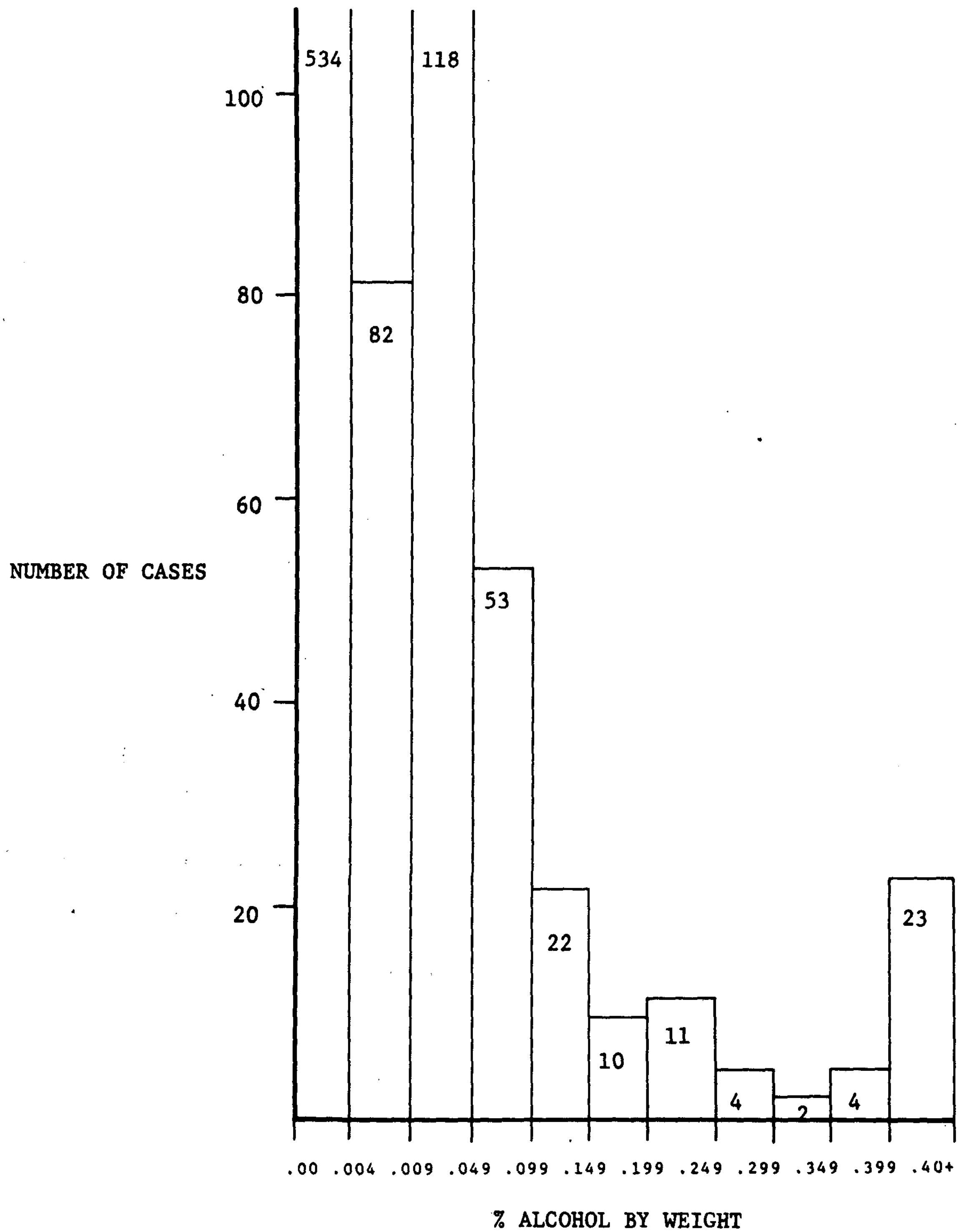


FIGURE 12

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - ALBERTA 1971

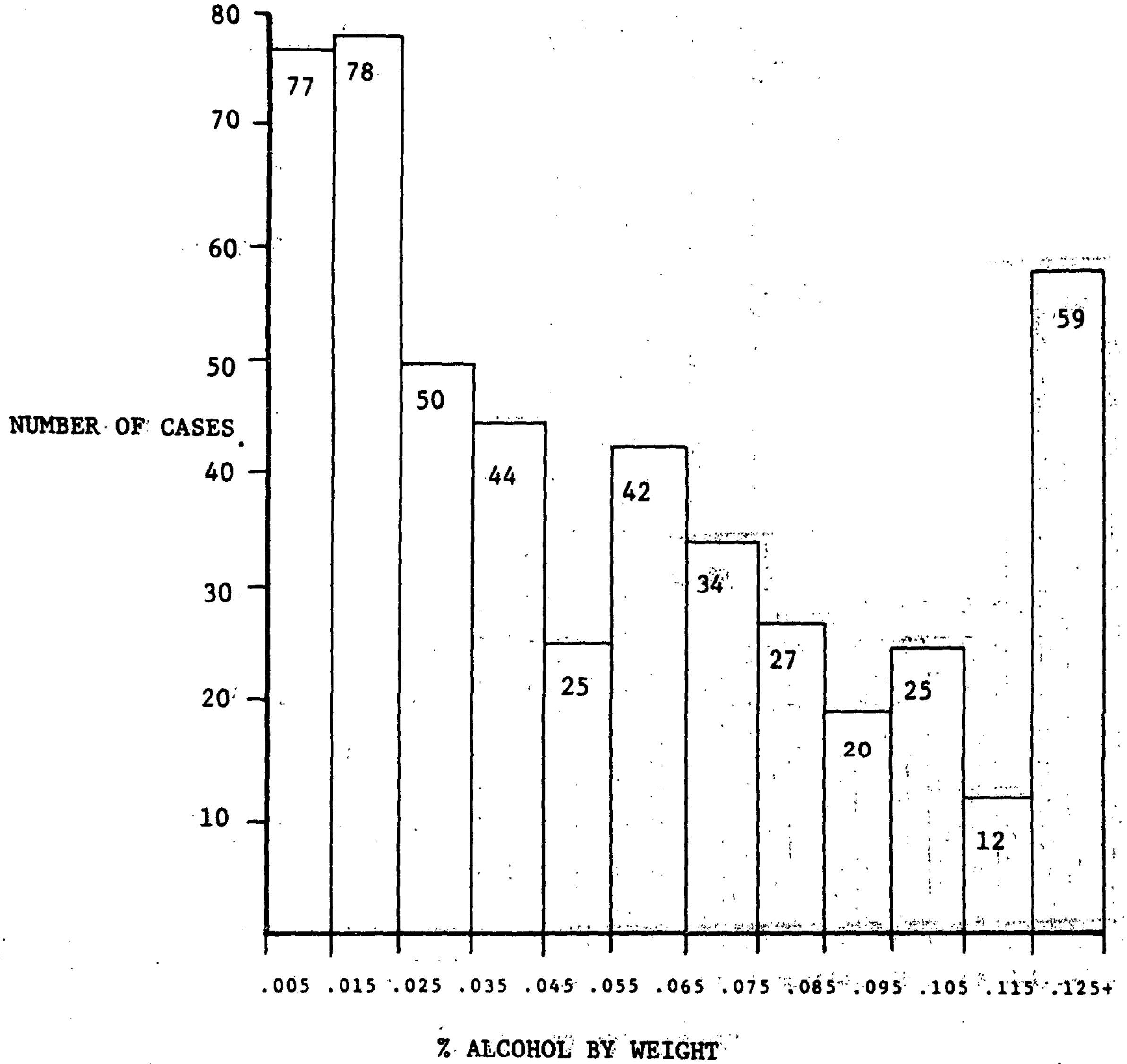


FIGURE 13

DISTRIBUTION OF BLOOD ALCOHOL LEVELS - EDMONTON CALGARY 1971

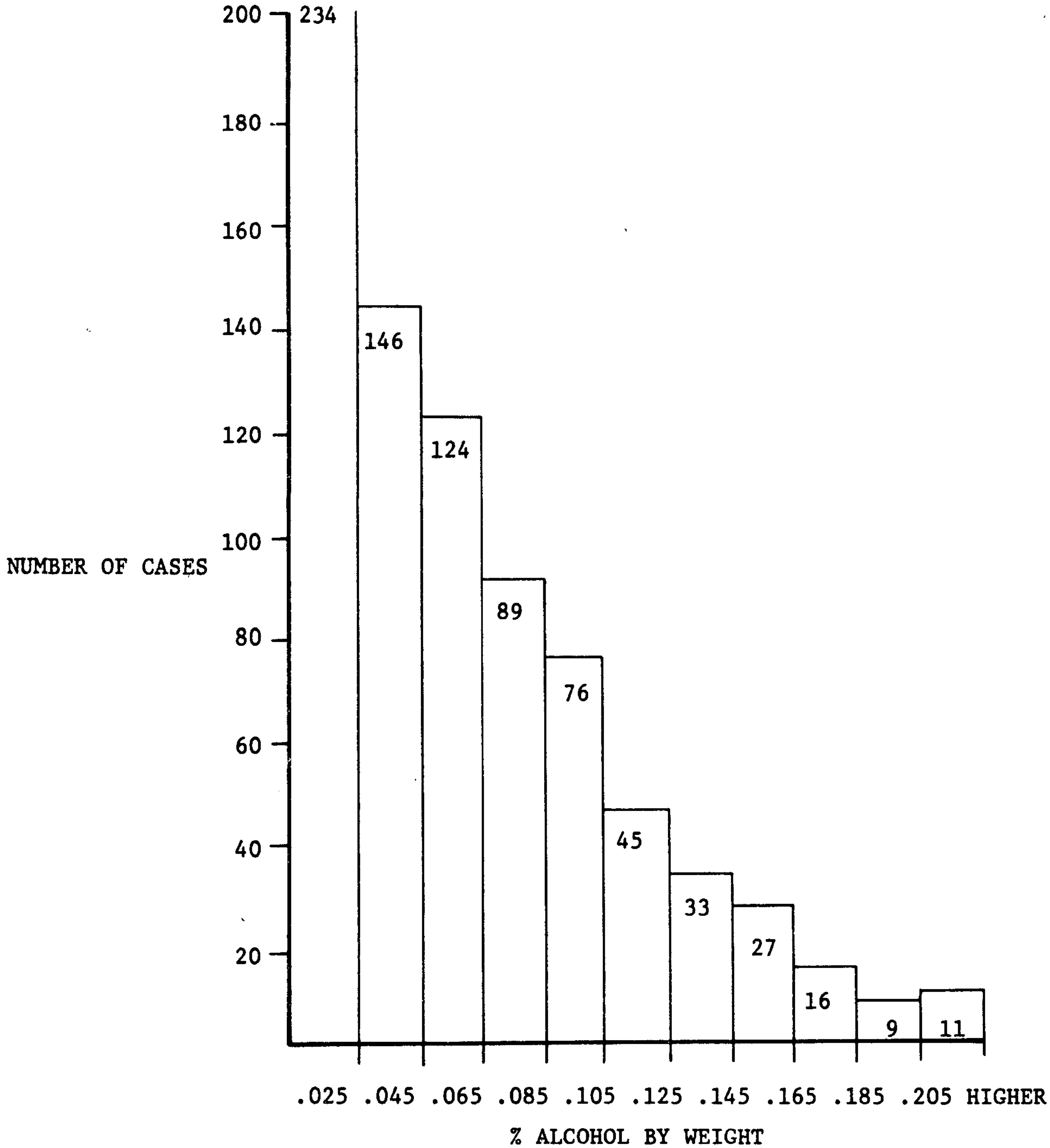


FIGURE 14

TABLE I

COMPARISON OF THIRTEEN ROADSIDE SURVEYS

	Length of Study	Time Periods Studied	Days
Holcomb (1938)	1 week	all day (continuous)	all week
Lucas (1955) et al	11 months	1830-2230	Monday to Saturday
Project ABETS Burlington, Vermont (1969)	Approx. 24 months	based on time of accidents	all week
French Study (1969)	15 weeks	all day	all week
Borkenstein et al (1964)	12 months	depended on time of accidents	all days
Dutch Study (1970)	3 months	2000-0400	Friday, Saturday & Sunday
Dutch Study (1971)	3 months	2000-0400	Friday, Saturday & Sunday
Washtenaw County U.S.A., (1970)	1 month	1900-0300	all week

	Length of Study	Time Periods Studied	Days
Mecklenberg County U.S.A., (1970)	9 consecutive nights	1900-0300	all week
Oslo, Norway (1971)	Approx. 24 months	2200-0200	all days
Albuquerque (1971)	4 days	3 time periods	Friday, Saturday, Monday & Tuesday
Alberta (1971)	16 days	2100-0300	all days
Edmonton - Calgary	12 days	1900-0200	Thursday, Friday & Saturday

	Persons Tested	Survey Crew	Police Involvement
Holcomb (1938)	1750	3 testers, 1 police officer, 1 supervisor, Total of 3 crews	only stopped car
Lucas (1955) et al	2015	special traffic police accompanied by a research worker from the Dept. of Pharmacology	police were present for accident but not survey
Project ABETS Burlington, Vermont (1969)	1184	one male and one female interviewer	stopped car and turned driver over to survey crew
French Study (1969)	7399		
Borkenstein et al (1964)	7590	one senior researcher and one interviewer	directed traffic into the interview site
Dutch Study (1970)	2675	2 police officers, 1 medical doctor, 2 interviewers, 1 supervisor, 1 breath tester Total of 3 crews	only stopped car

	Persons Tested	Survey Crew	Police Involvement
Dutch Study (1971)	2967	2 police officers, 1 medical doctor, 2 interviewers, 1 supervisor, 1 breath tester Total of 3 crews	only stopped car
Washtenaw County	748	1 crew at each site	stopped driver and directed him to survey crew
Mecklenberg County U.S.A., (1970)	766	2 crews at each site	stopped driver and directed him to survey crew
Oslo, Norway (1971)	1927		stopped driver and asked him to consent to undergo test
Albuquerque (1971)	863	1 field supervisor, 2 interviewers, 4 traffic officers, 2 supervisors Total of 2 teams	directed people to interview sites

	Persons Tested	Survey Crew	Police Involvement
Alberta (1971)	1897	5 police officers, 1 supervisor, 1 flagman, 2 interviewers, 2 testers	stopped driver, screened, then turned over to survey flagman
Edmonton-Calgary (1971)	10313	2 police officers, 2 testers, 1 flagman, 4 interviewers	directed car into survey site

	Random Selection of Cars	Breath Testing Device	Location
Holcomb (1938)	depended on speed of processing Subject	balloons later analyzed by Harger drunkometer	8 sites: 4 near liquor outlets and 4 not
Lucas et al (1955)	4 drivers passing accident scene at same time in same vintage car	balloons later analyzed by Harger drunkometer or Greenberg Alcometer	determined by location of accident
Project ABETS Burlington, Vermont (1969)	crash site, same day of week and time of day; 6 motorists going in same direction as crash car	Mobat Sobermeter (SM2) and Borkenstein Breathalyzer	all accident sites
French Study (1969)		Breathalyzer	national and provincial highways, including urban and suburban areas, country towns, and open country

	Random Selection of Cars	Breath Testing Device	Location
Borkenstein et al (1964)	direction of traffic selected determined by angle of second hand of a watch; the car selected was determined by the number indicated by the second hand	polyethylene bags later analyzed by the Breathalyzer	2000 sites
Dutch Study (1970)	1 car stopped every 8 minutes	blood test, 2 breath tests per Subject	60 sites, 3 per city; 1 at center and 1 on periphery of town
Dutch Study (1971)	1 car stopped every 8 minutes	blood test and 2 breath tests per Subject	60 sites, 3 per city; 1 at center and 2 on periphery of town
Washtenaw County U.S.A. (1970)	randomly selected with restriction that urban and rural locations represented, as well as medium and high volume of traffic	Breathalyzer	48 sites

	Random Selection of Cars	Breath Testing Device	Location
Mecklenberg County U.S.A. (1970)			27 sites
Oslo, Norway (1971)	police stopped every nth car	Alcotest	various areas
Albuquerque (1971)	only cars travelling in traffic survey direction were stopped	Crimper box (intoxi-meter). Gas chromotography done	24 sites
Alberta (1971)	depended on speed of processing subjects	Breathalyzer	20 sites
Edmonton-Calgary (1971)	depended on speed of processing subjects	Drink-O-Meter and Breathalyzer	12 sites

RESULTS

	% Drinking Drivers	% Drivers Impaired (.05% and Above)	Age
Holcomb (1938)	12% had been drinking	6% had BAC of .05% or above	peak age for drinking drivers was between 25 & 30
Lucas et al (1955)	as alcohol level increased, number of drivers decreased	8.7% had BAC of .05% or above	
Project ABETS, Burlington, Vermont (1969)	14% had BAC of .02% or above	7% had BAC of .05% or above	9% under 20 had alcohol; 15% aged 20-59 had alcohol; 6% aged 60 or over had alcohol
French Study (1969)	52.5% of drivers had BAC of .01% or above	6.9% had BAC of .05% or above	<24 and> 65 lowest % of drinking drivers. 35-54 high % of drinking drivers. 45-54 highest % of drinking drivers.

RESULTS

	% Drinking Drivers	% Drivers Impaired (.05% and Above)	Age
Borkenstein et al (1964)	10.9% had BAC of .01% or above	2.4% had BAC over .05%	no one under 17 had BAC over .04%. No one 18-29 had BAC over .07%. 2% of 25-34 year olds had BAC .08% or over. 2% of 35-44 year olds had BAC of .08% or over. Less than 1% of people over 65 had BAC of .08% or above
Dutch Study (1970)	26% had BAC cf .01% or above	12% had BAC of .05% or above	
Dutch Study (1971)	33% had BAC of .01% or above	17% had BAC of .05% or above	
Washtenaw County U.S.A., (1970)	25% were drinking	10% had BAC of .05% or above	16-20: lowest % of drinking drivers 31-40: highest % of drinking drivers

RESULTS

	% Drinking Drivers	% Drivers Impaired (.05% and Above)	Age
Mecklenberg County U.S.A., (1970)	22.2% had BAC of .02% or above	11% had BAC of .05% or above	16-19: lowest BAC. 31-40: highest BAC.
Oslo, Norway (1971)	2.8% had BAC of .01% or above	1.9% had BAC of .05% or above	
Albuquerque (1971)	28.6% had BAC of .01% or above	14.9% had BAC of .05% or above	20-24 year olds had highest % drivers at BAC's .01-.04%, .05-.09%, and .20-.39% 25-29 year olds had highest BAC at .10-.19%
Alberta (1971)	26% had BAC of .01% or above	12.9% had BAC of .05% or above	under 19 or over 60 have lowest probability of being over legal limit (.08%). 31-50: highest % of drivers over .08%
Edmonton-Calgary (1971)	6.7% had BAC of .01% or above	4.2% had BAC of .05% or above	

	Sex	Time of Day	Day
Holcomb (1938)	no difference between sexes when number of women driving at various hours is considered	19.5% of motorists on the road between 0200-0600 hrs are drinking drivers	on the weekend greatest number drinking-drivers appear. Between Mon. & Fri. it increases monotonically
Project ABETS Burlington, Vermont, (1969)	males drink more when driving than females		
French Study (1969)	at BAC levels at or over .08% there are 5 times as many males as females	1530-2000: highest % of drivers with BAC of .08% or above	Sat. - 3.9% had BAC over .08% Sun. - 2.9% had BAC over .08% Wed. - 2.2% had BAC over .08%
Washtenaw County U.S.A. (1970)	males more often drink while driving males drink more than females	0100-0300 hrs: high % of drivers with high BAC's	on weekend, a greater % of drivers had high BAC levels
Mecklenberg County U.S.A. (1970)	males are over-represented in the driving population	0100-0300 hrs: greatest % of heavy drinkers on road 1900-2100 hrs: fewest drinking-drivers on the road	weekend: high increase in number of heavy drinking drivers

	Sex	Time of Day	Day
Albuquerque (1971)	more female than male drivers had alcohol, but males had higher BAC's	% of drinking-drivers increased as the evening progressed	number of drinking drivers was great on weekend night
Alberta (1971)	More males drinking, and more males over legal limit	No. of drinking-drivers and no. of people over legal limit increases from 2000 to 0300 hrs.	Sat. and Sun. nights are worse

	Occupation	Education	Marital Status
Project ABETS Burlington, Vermont (1969)	greatest % of high BAC drinkers were upper class	no significant differences	no significant differences
French Study (1969)	-farmers and apprentices had highest % with BAC's over .08. -housewives, clergy, artists: none had BAC's over .08 -students, professionals: best record	increasing alcohol levels are positively related to post secondary, high school, and primary graduates, in that order	separated, divorced had highest % with BAC's over .08% singles: best at all levels of BAC
Borkenstein et al (1964)	highest % (3.68 of people in BAC range of .05-.10 were in low occupation group. At BAC's of .11 and above, there was no difference between low and semi-skilled groups	comparing those who did and didn't complete Grade 8, the less educated tend to drink less. Comparing those who did and didn't complete Grade 12, the more educated tend to drink more	3.11% of married people, 8.78% of divorced people and 10.09% of separated people had BAC's at or above .05%

	Occupation	Education	Marital Status
Washtenaw County U.S.A. (1970)	-craftsmen & servicemen: had highest % with BAC's at .05-.09% -operatives & labourers: had highest % with BAC's above .10%	not significant, but a tendency for people with 1-2 years of graduate work to be under-represented, and people with college degrees to be over-represented	separated, divorced, over-represented in drinking-driving population singles: smallest at BAC levels over .10%
Mecklenberg County U.S.A. (1970)		not significant, but those with over 16 years of education tend to be over-represented at BAC levels over .08%	separated, widowed and divorced are over-represented high BAC levels (≥ .10%)
Alberta (1971)	Sales staff are most likely to have been drinking: business people are most likely to be over legal limit		Separated people are over-represented in the drinking-driver and impaired-driver categories

	Drinking Patterns	Annual Mileage
Project ABETS Burlington, Vermont (1969)	30% of respondents had consumed beer within last 24 hours 16% had consumed hard liquor within last 24 hours	under 5,000 miles: smallest % of heavy drinkers over 15,000 miles, 20-59 year olds drink the most
Borkenstein et al (1964)	highest % (3.69) of people with BAC of .08% or above generally have 6 or more drinks per sitting	those who drive less than 5,000 miles a year drink less than those who drive more than 5,000 miles
Washtenaw County U.S.A. (1970)	home and bar are the most popular places to drink. Bars are the most popular places for second drinking episodes	
Alberta (1971)	Most drinking and impaired drivers had been drinking at a bar on the night of the survey	low probability for those who drive less than 5,000 miles a year to drink and drive

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DEVELOPMENT OF INTERNATIONAL CO-OPERATION

The situation by the end of 1971 was that a total of nineteen roadside surveys had been conducted in eight countries. These surveys had employed a variety of techniques within equally varied experimental designs. There was an obvious need to standardize methodology in order to make the results of one study more comparable to the results of other studies. Researchers and administrators were anxious to make comparisons between countries, in order to evaluate the extent of the problem and the effectiveness of countermeasures' activity in the various countries. What was needed was some sort of international effort to standardize methodology.

London

On September 24, 1971, a meeting was held in London, England of the Plenary Group of the OECD Initiated Group of Experts on the Effects of Alcohol and Other Drugs on Driver Behaviour. Among the group's proposals to the OECD Steering Committee, was a proposal that "an international committee with representation from all interested countries be established for the purpose of deciding upon a mutually acceptable experimental design and methodological outline, to be adhered to in the conducting of roadside surveys of the blood-alcohol concentrations in the driving population".

It was also proposed that "following the convening of the above mentioned committee, a co-operative research project be undertaken by interested countries. This project would be conducted in accordance with the principals established by the above committee, and would involve the simultaneous gathering of blood-alcohol data by participating countries".

It was decided that the activities of this newly established Sub-Group on Roadside Surveys would be co-ordinated by Dr. Carl Stroh of Canada.

Ottawa

In March of 1972, using the good auspices of both the North Atlantic Treaty Organization and the Organization for Economic Cooperation and Development, Canada invited all the member countries of both organizations to send delegates to attend a meeting in Ottawa. The main objective of this meeting was to delineate and specify a basic experimental design and methodological core which would be adhered to by all countries wishing to conduct roadside surveys of the blood alcohol concentrations in the driving population. Positive responses were obtained from 16 of the 23 countries which were invited to participate and delegations from six countries attended the four day meeting (March 6-9). Several other countries which were unable to send delegates presented their views in writing to the Committee Chairman.

A complete list of delegates to the Ottawa conference is presented in Appendix 1.

All of the delegates were of the opinion that it is both feasible and desirable to conduct roadside surveys on an internationally comparable basis. In reaching this decision, the delegates were aware that participation in such an international study would mean that individual countries might have to make certain compromises, and might have to sacrifice some of their freedom to manipulate experimental variables. It was agreed that the benefits to be gained through international comparisons would more than make up for any restriction of individual variability.

It was decided that the Sub-Group should set for itself two main tasks:

1. The delineation and specification of a basic experimental design and methodological core which would be adhered to by all countries participating in the international study. In order to accomplish this goal, it was decided to establish the absolute minimum requirements for a roadside survey. Each country would then be free to add to this minimum as they saw fit. Furthermore, as time passed, and as the level of knowledge in this area increased, new items could be added to this basic core. What this means is that if the time period from 2200 to 0200 hrs is specified as part of the basic experimental design, a country would decide to collect samples from 1800 to 0300 hrs for example, or during any other time period they wish, so long as they also gather information during the time period 2200 to 0200 hrs. It is only the data gathered during this "core" time period which would be used for the purpose of international comparison, although the additional information gathered during non-core time could be used by individual countries in evaluating their countermeasures' programs.

2. The second task which the Sub-Group decided to apply itself to was the construction of a list of basic guidelines or suggestions for conducting roadside surveys. These guidelines and recommendations would be made available to all those people wishing to conduct roadside surveys, but would not be made compulsory.

   The reason for creating a set of non-compulsory guidelines was that it was felt that compliance with these guidelines was not absolutely necessary for the purpose of making international comparisons, and that if we had made these guidelines compulsory, potential participants in the international roadside survey might be discouraged by a long list of conditions and prohibitions.

Because of the limited amount of time available and the many intricate problems which had to be given full consideration, it was agreed to devote the conference to the setting down of the basic experimental core. In order to accomplish the second goal of preparing a list of recommendations, each delegate agreed to prepare a detailed list of recommendations for conducting roadside surveys. These lists were to be forwarded to the Conference Chairman by June 1st, 1972. It would then be the Chairman's responsibility to construct one large list of recommendations, eliminating only those duplications which might occur.

For the purpose of the experimental core it was decided to specify the collection of breath samples for analysis of alcohol content. Blood, tissue, or urine samples may be gathered in addition to breath samples, but are not to be specified as part of the experimental core.

Rather than specify particular instruments, it was decided to specify operating specifications, and allow each country to choose its own instrument, so long as it meets the specifications laid down by the Committee.

A detailed list of operating specifications for breath testing devices was presented by Dr. Borkenstein and was generally accepted by the group. Dr. Borkenstein agreed to present a revised list of specifications to the Chairman, who would then arrange for both English and French versions to be sent to the various Conference delegates for their approval.

The two main criteria to be met by any instrument were:

1. that it indicate a value of within ± 10% of the target value value when the target value is 100 mg of alcohol per 100 ml of blood, and

2. that at least 500 ml. of air be expired by the subject before a breath sample is taken for the purpose of analysis (the reason for this is to ensure that a deep lung sample is obtained). For those breath testing devices which do not control the amount of air which is expired before the sample is taken, a simple plastic bag placed along the air intake tube would ensure that the minimum amount of air had been expired before the sample was taken.

It was agreed that breath samples could be analyzed either in the field at the time they are taken, or in a laboratory at some later date. The only restriction on the latter procedure would be that the total procedure must comply with the specifications laid down for the breath testing device to be used in this international survey.

Regarding the control of environmental variables, it was decided that these should be handled as recommendations rather than as a part of the required experimental core.

The general feeling was that altitude was perhaps not worth worrying about at this time.

It was agreed that temperature in the immediate testing environment must be at least within the range specified by the manufacturer of the particular breath testing device being used. Furthermore, if testing is to be done under conditions of extreme cold, an attempt must be made to ensure that the subjects' mouth temperature is, in fact, at body temperature. Bringing the subject into a warm environment for a short period of time, or having the subject keep his mouth closed for a period of one minute, are both methods of accomplishing this temperature equilibrium.

Humidity is not likely to be a critical factor unless it is so extreme as to interfere with the operation of the breath testing device because of condensation in the intake system or on some critical part of the machine. As a rule, this condensation can be prevented by ensuring that the breath testing device has an adequate heating capacity.

In deciding on when, where and how to collect samples, it was decided to gather a representative sample during a restricted, high-probability time period. The reason for trying to obtain a representative sample was to enable inferences to be made from the sample to the general population on the roads during the time period selected. The reason for selecting particular time periods during which there is a higher probability of finding drinking drivers, was to attempt to obtain (within the confines of limiting sample size) as sensitive an indicator as possible of the proportion of drinking drivers on the road. It was realized of course, that conclusions regarding the general population would have to be limited to the population on the road during the particular times of the sampling, and that generally speaking, the proportion of drinking drivers in the general population would not be nearly so great as indicated during these high probability hours.

Those countries who have not used roadside survey techniques before may want to employ the roadside survey technique primarily as a tool for the detailed epidemiological study of the drinking-driving problem (descriptive phase of roadside surveys). These countries will undoubtedly want to sample during a much wider time period than just the core period. Other countries may be primarily interested in the roadside survey technique as a means of evaluating newly introduced countermeasures (evaluative phase of roadside surveys). This group of countries will probably want to stick more closely to just the core time periods. This should involve no problems so long as those countries in the descriptive phase include the basic methodological core and basic core times in their initial studies. This will enable them to use the core data for baseline purposes in the later evaluative phase.

The four-day Ottawa Conference was successful in reaching agreement on most of the points of design and methodology. Since there were still some areas which required further discussion, the delegates agreed to hold a two-day meeting on impaired driving surveys in Paris at the end of June, in conjunction with the United States organized meeting on breath testing devices.

Paris

Pursuant to the decision reached at the Ottawa conference, a meeting was held on June 28 and 29, 1972, in Paris. The complete list of delegates to this meeting is presented in Appendix 2.

Regarding the proposed standards for breath testing devices, it was suggested that it might be more appropriate to describe instruments in terms of their accuracy in determining blood alcohol concentrations. However, after much discussion, it was decided that it would be better to use the suggested standards, and await the results of a proper study to show the exact relationship between blood and breath alcohol concentrations.

Concern was expressed by several of those countries which had not been able to attend the Ottawa meeting that the hours and days chosen to be the "core" time, were not the most critical times in their countries. It was agreed that the "core" time could be changed in some countries, once data was available which would allow more accurate determination of the most critical times. It was emphasized, however, that this decision should only be based on concrete data, a pilot study would be required in order to determine which days were the most critical.

It was agreed that survey sites would be selected on a random basis. The exact procedure employed by each country in order to obtain this random selection will be different, since each country is limited to its own and peculiar data base. In order to provide guidelines for selecting sites, a detailed description of the site selection procedure used by those countries which will conduct surveys in 1973, is included in Appendix 3.

After much discussion, it was agreed that enough drivers should be sampled to ensure that a sample of <u>at least</u> 100 drinking drivers is obtained. In those countries which do not have any preliminary data to indicate how many samples will be required, a sample of 2,000 drivers should be obtained. This number is based on the assumption that in any country, at least 5% of the driving population on the roads during the "core" time will have been drinking.

The number of sites required will be determined by a combination of the total sample size, the hours spent at each site, the number of survey crews, etc. The delegates agreed that as many sites as possible should be employed. With this in mind, it was decided to recommend that each country sample from as many sites as deemed necessary and feasible within the experimental design.

The objectives of conducting roadside surveys on an internationally comparable basis were discussed in some detail. The major objectives were:

(a) To be able to compare the effectiveness of countermeasures' programs employed in various countries.

(b) To be able to increase the epidemiological data base.

(c) To provide a sound data base against which changes in any one country can be more adequately interpreted.

The possibility of allowing studies conducted in segments of countries to be considered as part of the international study was discussed and rejected by the delegates. Only studies of whole countries will be included.

As much of the data form as possible should be completed for:

(a) Those drivers who participate in the survey;

(b) Those drivers who refuse to participate in the survey; and

(c) Those drivers who would have been selected to participate in the survey, but who were arrested by the police

The need for new nomenclature was agreed upon. At the present time, "BAC" is used to indicate the blood alcohol content as determined by both blood analysis and breath analysis. The alternate "BAQ" which was used often at this meeting was rejected as an adequate alternative. It was decided to recommend to the Plenary Group that some scientific body be requested to develop a new nomenclature.

The next meeting of this group is planned for the fall of 1974. By that time, roadside surveys will have been conducted in several countries. The data will have been analyzed, and a rough draft of the first report will have been prepared. The purpose of this meeting will be to discuss the draft report, make changes in the experimental design, etc. Canada agreed to undertake the task of collecting data for the first international study.

It is recommended that those countries which are interested in this area translate their relevant literature into either French or English, so that researchers in other countries may benefit from their experience.

RESEARCH METHODOLOGY

Biological Specimen

The biological specimen of choice for the determination of alcohol concentration is breath. Blood, tissue, or urine samples may be gathered in addition, but are not acceptable as substitutes for breath samples.

Results of breath alcohol analysis shall be reported in terms of BAC, based on milligrams of alcohol per 210 liters of deep-lung air. Using this system, "100" is equal to ".10% BAC w/v" or "1.00°/00 w/v". If an instrument displays only two digits, the third shall be a "0".

Breath Testing Device

The breath specimen analyzed shall be expired deep-lung air. This is any phase of the breath that follows the first .5 liter of an exhalation. Determination of the BAC shall be based on the ratio between alcohol present in the blood and whole deep-lung air, using either a known volume or a continuous flow system. Indirect determination of the BAC by quantitative breath alcohol analysis shall be based upon the following ratio: 2.1 liters of expired deep-lung air contain the same quantity of alcohol as one milliliter of blood.

Loss of alcohol (from the breath specimen) through condensation shall be prevented by maintaining the breath specimen at a temperature sufficiently above body temperature, or by other satisfactory means.

In the analysis of vapors of known alcohol concentration over the range corresponding to BAC's of 50 to 300, the instrument must be capable under field conditions of determining the BAC equivalent of the true value to within ± 10% of the true value.

When vapors of known alcohol concentration over the range corresponding to BAC's of 50 to 150 are analyzed, under laboratory conditions, the results of a minimum of 50 consecutive determinations at any one concentration must have a standard deviation (sigma) not greater than 3. When vapors of known alcohol concentrations over the range corresponding to BAC's of 150 to 300 are analyzed, under laboratory conditions, the standard deviation (sigma) of a minimum of 50 consecutive determinations at any one concentration must not exceed 2% of the expected value.

The instrument must be capable of performing a blank analysis on ambient air, free of alcohol, that yields an apparent BAC of no more than 10.

Instruments which singly or in combination collect a deep-lung air sample and temporarily store the specimen or its contained alcohol for subsequent analysis (remote sampling devices), shall meet all stated performance requirements. Such instruments shall be designed so that the result obtained is independent of barometric pressure or designed so that the result obtained is correctable for barometric pressure change if such correction is necessary.

A means must be employed to ensure that the subject has not ingested alcohol for at least ten minutes prior to collection of the breath specimen. The following alternatives are suggested:

a. Collect the specimen at the end of the interview. This will allow above five minutes of continuous observation during which the subject must not drink either an alcoholic or non-alcoholic beverage, or eat food. He should not smoke for at least one minute before the sample is collected.

b. If the result is positive and the subject assures that he has had no alcoholic beverage for at least twenty minutes, the answer can be accepted.

c. If the subject affirms that he has consumed an alcoholic beverage within the last twenty minutes, a second test should be administered after allowing an additional five minutes. The second test should be recorded. This step should rarely be necessary.

d. If the answer is negative, the result can be accepted without question.

The testing procedure will include the analysis of a suitable reference or control sample such as air equilibrated with a reference solution of known alcohol content at a known temperature, the result of which analysis must agree with a 100 BAC reference sample within the limits of ±10 BAC. Frequency of such monitoring of accuracy shall be dependent on the stability of the method employed.

<u>Time</u>

Samples must be gathered during the time period extending from 2200 to 0300 hrs.

<u>Day</u>

For the purpose of international comparison, samples must be gathered on Friday and Saturday nights.

Month

As to the time of year, it was decided to merely require sampling to be done either during the Spring, the Fall, or both. Winter and Summer were eliminated because of a desire to reduce variation due to tourists and to climatic extremes. To all intents and purposes by "Spring" is meant March, April, May and by "Fall" is meant September, October, November.

Year

Sampling will be done on a yearly basis whenever possible, and will begin in 1973 for at least five countries.

Vehicles

It was agreed to sample all motorized vehicles (cars, trucks, motorcycles, mopeds, etc) except:

1. Commercial vehicles (large trucks, taxis, small trucks used for commercial purposes); and

2. Vehicles bearing foreign registration plates (the purpose of this exception was to restrict the core sample to just the residents of a country).

It was further decided that the vehicle type should be recorded for each sample. In this way, it will be possible to select a sub-group such as automobiles for further consideration at some future date.

Sample Selection

It was agreed that in order to be able to properly evaluate a shift at the upper end of the BAC distribution, it is necessary to see what is happening to the rest of the distribution, as well. It was deemed essential to gather complete information on both the drinking driver and the non-drinking driver who are selected for the survey.

Samples will be selected on a time-interval basis. The length of this interval will be equal to the total processing time for each subject (i.e. if the interview team can handle one person every five minutes, then a driver will be selected from the traffic stream every five minutes).

Vehicle Flow

It was felt that some measure of vehicle flow past each survey site would be necessary. The delegates decided that a simple measure of total traffic flow (only counting those vehicles which are travelling in the same direction as those vehicles which are selected for the survey) would be sufficient, and that a breakdown by vehicle type would not be required.

Time Limit

It was agreed that, if possible, a maximum time of two hours should be spent at any one site. If a longer period of time is necessary for practical reasons in some countries, then only the data from the first two hours should be considered as part of the data for the international study. If this is the case, it should be ensured that the first two hours of testing fall within the 2200 to 0300 hrs core segment.

Site Location

It was agreed, after much discussion, that site locations would be chosen on a random basis, rather than on a biased basis (i.e. selecting only prior crash locations). This means that the sites for the roadside survey must not be chosen because of their nearness to drinking locations, poor accident history, etc.

Sample Size

The number of drivers tested must be large enough to ensure that a sample of at least 100 drinking drivers is obtained. If there is any doubt as to how many drivers need to be tested in order to obtain this number of drinking drivers, 2,000 drivers should be tested.

Number of Sites

Samples should be obtained from as many sites as possible, and no site should be visited more than one time. Since crews will spend a maximum of two hours at each site, the number of sites required is determined primarily by the total required sample size, and the number of survey personnel present at each site.

Survey Area

For the purpose of the international study of drinking-driving behaviour, only studies of entire countries will be allowed. This does not preclude the sampling of regions to be evaluated, but does prevent the submission of a multitude of minor studies of small and perhaps atypical areas of a country.

<u>Subjects</u>

As much of the data form as possible should be completed for: (1) Those drivers who participate in the survey; (2) Those drivers who refuse to participate in the survey; and (3) Those drivers who would have been selected to participate in the survey, but who were arrested by the police.

Survey Questionnaire

The following information should be obtained for each subject. All data which is to be used in the international study must be presented in this format.

Questionnaire

*Note: All spaces must contain a number. Where appropriate, place "0" in blank space.

☐☐ 1. Country (each country will be given a number)

☐☐☐ 2. Site number

☐☐ 3. Subject number (start with "1" at each site)

☐ 4. Location (1= City; 2= Country)

☐☐ 5. Day of month

☐☐ 6. Month

☐☐ 7. Year (73, 74, etc.)

☐ 8. Day of week (1= Sun; 2= Mon; 3= Tues; 4= Wed; 5= Thurs; 6= Fri; 7= Sat)

☐☐ 9. Hour of day (24-hour clock)

☐☐ 10. Minute of hour

☐ 11. Vehicle type (1= Car; 2= Truck; 3= Motorcycle; 4= Other)

☐ 12. Sex of driver (1= Male; 2= Female; 3= Undetermined)

☐ 13. Number of passengers (9= 9 or more)

14. Will you use miles, or kilometers in this form? (0= miles; 1= kilometers)

15. 0= Subject agrees to participate 1= Subject refuses to participate 2= Subject removed from sample by police

16. Where were you when you last entered your vehicle? (0= refusal; 1= home, 2= friend's house; 3= work; 4= restaurant; 5= pub or bar; 6= other)

17. Where will you be when you next leave your vehicle? (0= refusal; 1= home; 2= friend's house; 3= work; 4= restaurant; 5= pub or bar; 6= other)

18. How many miles (kilometers) do you estimate that you will have driven from the time you last entered your vehicle until you next leave your vehicle? (000= refusal; 001= 1 mile or less; 999= 1000 miles or more)

19. How many hours of driving will this involve?

20. Minutes involved? (00= refusal)

21. What is the purpose of this trip? (0= refusal; 1= recreation; 2= long trip; 3= commercial; 4= to or from work; 5= other)

22. How many thousand miles (kilometers) would you estimate that you drive in an average year? (000= refusal; 001= 1000 miles or less)

23. Do you have an amateur or a professional driving license? (0= refusal; 1= amateur; 2= professional; 3= none; 4= other)

24. How old were you on your last birthday? (00= refusal)

25. What is your occupation?

1= Business	5= Office	9= Other
2= Professional	6= Farmer	0= Refusal
3= Student	7= Labourer	
4= Sales	8= Tradesman	

26. Blood Alcohol Concentration (999= refusal)

In addition to the preceding information, which must be provided for each subject, the following information is required for each site, and must be submitted in the format shown.

<u>Site Data Card</u>

*<u>Note</u>: All spaces must contain a number. One card must be completed for each site.

1. Country
2. Site number
3. Temperature (°C) 0= temperature above 0; 1= temperature below 0
4. Altitude (feet or meters)
5. Precipitation (0= none; 1= rain; 2= snow; 3= other)
6. Vehicle count (in direction sampled)
7. Have you used feet or meters to measure altitude? (0= feet; 1= meters)

RECOMMENDATIONS FOR CONDUCTING ROADSIDE SURVEYS

Pilot Projects

Those countries which are intending to participate in the international study, and which have not yet conducted roadside surveys, should undertake small scale pilot projects first, in order to gain first-hand experience with roadside survey techniques. The experience of those countries which have conducted roadside surveys demonstrates the value of such pilot studies.

Publicity

It is highly advisable to have some sort of press release prior to conducting a roadside survey. The main purpose of this release will be to give the press an accurate picture of what is transpiring, and thus prevent distortion and possible public reaction which might develop in the absence of accurate information. The press release must not contain any information as to the time or the location of future roadside survey sites.

Police Involvement

In the case of voluntary surveys (as will be conducted by most countries) the police contact with the driver should be minimal. The survey should be introduced and explained to the driver by the trained survey personnel, and not by the police officers.

Additional Data

It is suggested that roadside surveys of drinking-driving behaviour will afford the opportunity of gathering other information on the driving population. Seat belt usage, for example, is one piece of interesting information which can also be gathered for virtually no extra cost. The gathering of any additional information must not interfere with the primary purpose of the survey.

Lighting

The survey site, and in particular the area around the person responsible for stopping and directing traffic, must be well illuminated. It is suggested that a minimum of two 1.5 kw quartz-iodine spotlights be employed. Flashing red lights of a type employed by the police have been found to be most helpful in alerting drivers and reducing the speed of approaching vehicles.

Signing

Motorists should be given adequate warning that there is a survey in progress, and that they may be required to stop. Speed in the immediate survey area should be controlled and reduced to a safe level.

Site Location

The survey site should be located so as to provide adequate site distance from both directions. Every effort should be made to ensure that adequate space is available for the survey vehicles as well as a number of subject vehicles. Whenever possible, site locations should be chosen which do not provide the motorists with an opportunity to turn off the road when they realize that a survey is ahead.

Maintenance

Consideration should be given to hiring a general-purpose repairman as part of the back-up crew. The usually tight scheduling of roadside surveys demands that equipment failures be dealt with almost immediately if a large number of subjects is not going to be missed.

Hospitality Items

The providing of hospitality items such as coffee, cookies, etc., is not recommended. Although these things do create an informal atmosphere, and help the subjects to relax, they also contribute to congestion in the interview area and greatly reduce crew efficiency. It might be worthwhile to have an extra thermos of coffee available for unusual situations (such as an impaired driver having to wait for alternate transportation to be arranged). Opinion is not unanimous on this point as some researchers feel that hospitality items can be of considerable assistance in obtaining driver co-operation.

Interviewers

Interviewers should wear some sort of clothing or device that identifies them as members of a research team (e.g. arm-band, or white lab coat). It has been found in some studies that female interviewers had less difficulty than male interviewers in obtaining subject participation.

Smoking

Smoking by the subjects must not be allowed in the period immediately preceeding the taking of a breath sample. To this end "No Smoking" signs in the testing area would be most appropriate. Furthermore, interview and testing staff should not smoke while in the test area or while interviewing subjects. The purpose of this is to discourage smoking by subjects.

Rest Days

In any survey of longer than seven days duration, two days of rest must be afforded each of the survey personnel. This was found to be necessary not only because of the physical demands of the job (irregular hours, a lot of travel, etc.), but also because of the psychological stress of a situation that involves confrontation with the public under unusual circumstances.

It should also be mentioned that these rest days can also be utilized most efficiently for repairing equipment, obtaining needed supplies and parts, etc.

Preliminary Planning

Perhaps the most vulnerable part of this sort of survey is in the area of planning and negotiations. Sufficient time must be set aside to ensure that the support of all relevant agencies is fully obtained before the initiation of the survey. It is also suggested that a clear statement of the survey operation and methodology be prepared and circulated to all key people.

First-Aid

Because the survey crews will be out on the roads, often in rather remote areas, they should each be provided with a First-Aid kit. At least one crew member should be able to perform elementary first-aid. The purpose of the first-aid precaution is to provide emergency aid not only to crew members, but also to members of the driving population who may become involved in accidents at or near the survey site.

Training

The need for and importance of adequate staff training cannot be overemphasized. Interview staff must have prior experience not only in presenting the project to the public and encouraging participation, but also in completing the interview forms. Breath-testing staff must be thoroughly familiar with their equipment and should be able to undertake emergency repairs on the breath-testing devices.

Interviewer Observation

Several researchers feel that it is very worthwhile to have the interviewers make an initial estimate of whether or not the driver has been drinking. In the event that there is a large number of refusals, this procedure would perhaps provide valuable information as to the type of person who refuses to take part.

Appendix 1

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Appendix 3

Examples of site selection procedures

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The road system in Norway is divided into road sections. Survey sites are obtained by randomly selecting the desired number of locations from the total population of road sections.

Since the probability of a section being selected is made proportional to the usual traffic density of the section, most survey sites will be located on relatively high-traffic-density roads.

CANADA

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Canada is divided into ten provinces and two regions. The number of survey sites to be alloted to each of these twelve areas is directly proportional to the number of registered drivers in each area: if one province has 20% of the total number of registered drivers in Canada, then 20% of the total number of survey sites are assigned to that province.

Once the number of sites to be established in each province has been determined, the next breakdown is in terms of city vs country (survey sites are not set up within the limits of small towns). Once again, the proportion of sites assigned to each category is determined by the relative numbers of registered drivers found in city and country areas.

Having determined the number of sites to be located in cities and the number to be located in towns, the country sites are determined to within approximately ten miles by arbitrarily selecting points on a map. The principles used in this selection process are, (1) that mostly main roads be selected, and (2) that the sites be distributed as much as possible throughout each area of the country (not centralized in particular areas of each province). The only factor that inhibits to some extent this geographical dispersion is the fact that the sites visited by one team in one night must be no more than forty miles apart.

Once country sites have been located to within 10 miles, an engineering consultant is hired to travel to each site area and select the exact location. This selection is based entirely on the physical characteristics of the site such as:

1. Sight distance approaching the site from either direction;

2. Sufficient room for research vehicles, police, and subjects' vehicles;

3. Absence of turn-off roads immediately before the survey site.

The cities to be sampled are determined on an arbitrary basis. The only operating principal in this case is that the cities selected should be as widely separated as possible. Once the cities have been chosen, the exact survey sites are determined by an engineering consultant. As in the selection of country sites, only physical characteristics are considered in this selection. Some of these characteristics are:

1. Sufficient room for research vehicles, etc.;

2. Availability of some power source;

3. Absence of turn-off roads immediately before the survey site.

Also, the sites within a particular city are chosen so as to cover as many different areas of the city as possible (geographical areas).

UNITED STATES

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The purpose of this survey, in keeping with the requirements of the research methodology for the International Roadside Survey, will be to select a weighted, random sample of all motorists using the road within the time periods specified within the United States. Because of the large, heterogeneous nature of the United States, obtaining such a sample may be extremely difficult and costly. As a result, it may be necessary to eliminate certain special areas from the survey, (i.e., Alaska, Hawaii, Puerto Rico, etc.). The current plan which is subject to further study and refinement prior to the first survey in 1973 is described below:

I. Site Selection:

1) Fifty census tracts will be selected to provide a broad sample of geographical locations and urban and rural settings. The number of samples taken in each of these census tracts can be adjusted to reflect motor vehicle registration and population figures which are available for each census tract. Alternately, the data collected in each census tract can be weighted to compensate for differences in vehicle registration and population.

2) Within each census tract two sites would be chosen by placing a grid over the tracts thereby dividing the tract into small units. Units will be classified as to the types of roadways they contain.

   Two sites will be chosen in each census tract so as to provide a random sample of area roadway characteristics. Selected sites will be surveyed to determine whether they can be safely sampled. In the event a site is rejected, a new site will be chosen by the same random process.

3) A minimum of ten subjects will be sampled at each site. Cars to be stopped at random based on interviewer availability. A minimum total of 1,000 subjects will be collected which is expected to yield at least 200 drinking drivers, based on U.S. experience to date.

4) At least four survey teams will be used, with each sampling two sites each weekend night. The survey should be completed in approximately thirteen nights or seven weekends.

HOLLAND

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Holland is divided into four regions. Within each region three classes of towns are distinguished based on the number of inhabitants: (1) 20,000 to 50,000 inhabitants; (2) more than 50,000 inhabitants; and (3) large cities.

For each region and for each class, a number of towns have been randomly appointed. The ratio of the number of towns in the sample to the actual number of towns, is approximately equal for each region and for each class.

Two sets of towns have been chosen. If for some reason a town from the first set could not be included in the survey, a replacement town from the same region and class was taken.

Selection of sites per town: In co-operation with the local police, three sites were selected in each town based on the following criteria:

- one site in the centre
- two sites on the periphery
- some traffic during testing hours
- stopping of cars had to be safe
- parking opportunity
- public lighting
- no change of road-network in near future (for the sake of repeatability)

FRANCE

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The survey will cover the whole French territory.

Since the territory is geographically divided into departments, the locations will be chosen out of departments selected in order to form a representative whole. Within each department, locations will be chosen with respect to the urban-non-urban dichotomy.

In non-urban centres, the road system is divided into road categories (RN, RD, AT); we will therefore select the survey locations in proportion to the traffic index of these categories. Then, within each road category, we will choose the locations at random with the exception of autoroutes where the survey sites will be chosen with respect to practical possibilities (tollbooths or lay-bys).

In urban zones, we will proceed to a squaring and to a draw by lot from among units grouped according to a population (or traffic) index.

APPENDIX D

Appendix D-1

SCIENTIFIC ROADSIDE SURVEYS OF ALCOHOL IN THE DRIVING POPULATION

This manual was developed by a special group of the National Safety Council's Committee on Alcohol and Drugs. It supports the program for the international conference on roadside surveys and expands many of the details listed in the Canadian Ministry of Transport's publication, Roadside Surveys of Drinking-Driving Behaviour: A Review of the Literature and a Recommended Methodology.

The ideas expressed in this manual are purely suggestions and do not alter the basic experimental design and methodology core developed by the OECD Sub-Group on Roadside Surveys for conducting roadside surveys on an internationally comparable basis.

A special film has been produced to illustrate parts of this manual.

May 1974

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Special group of the National Safety Council's Committee on Alcohol and Drugs:

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Professor M. W. Perrine, Member
Lowell C. Van Berkom, Member
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The section on site selection is based on materials provided by:

Richard W. Crowther, Ministry of Transportation and Communications, Ontario

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Indianapolis Police Department
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Indiana University Institute for Research and Public Safety
Indiana University Audio-Visual Center

FOREWORD

The sudden explosion of automobile usage throughout the world during the sixth decade of this century has precipitated an intense interest in reducing the public safety problems it has generated. What was not too long ago a minor problem in most nations of the world is now a high priority public health problem, especially in terms of mortality and morbidity in young adults. The crude problem measurements that have characterized the field of traffic safety in the past are giving way to more subtle and useful methods of analysis. The measurement of the frequency of occurrence of factors highly correlated with traffic crashes is one of these.

The high frequency of excessive blood alcohol concentrations (BAC's) manifests itself in fatal and other serious traffic crashes. This high frequency is gross overrepresentation when considered in the context of surveys of the frequency of occurrence of high BAC's in the traffic flow. Thus a measurement of the frequency of high BAC's in the traffic flow becomes an intermediate measurement of the problem against which alcohol countermeasures can be directed. Continuous (time series) or intermittent measurements of this type tend to assess the magnitude of the problem and also to sense changes that, if properly evaluated, can be attributed to spontaneous or deliberate changes introduced into the system.

It is the purpose of this manual to offer suggestions for conducting roadside surveys to determine the frequency of occurrence of alcohol in the traffic flow for international comparison. Roadside testing of drivers has been used for other purposes. For instance, this process has been used for enforcement purposes in some jurisdictions, also for its deterrent effect even though no arrests are made. Both of these applications demand high visability through public information to enhance their deterrent effect.

If such surveys are intended to assess the extent of the problem and to evaluate countermeasure activities, they must be conducted inconspicuously so as not to become countermeasures in themselves; however, in order to obtain maximum cooperation from the public, there should be some prior knowledge of the activity. While this seems to be a paradox, it can be achieved.

If one considers the very small sample size that must be treated as being representative of an entire nation when international comparison is the goal and if one considers the small percentage of drivers who are on the highways with high BAC's, the need for a rigorous methodology becomes apparent. Standardization is imperative. The suggestions that follow are not difficult to achieve and will lead to reasonable international standardization.

By the end of 1971, nineteen roadside surveys to determine the BAC distribution in the driving public had been conducted in eight nations. There was no standardization of methodology and therefore little opportunity for making valid comparisons. The need for an international move towards standardization was recognized by researchers and administrators. On September 24th, 1971, a meeting of the plenary group of the Organisation for Economic Co-operation and Development (OECD) Experts on the Effects of Alcohol and Other Drugs on Driver Behaviour was held at the British Medical Association House in London. A proposal resulted from this meeting to the effect that "an international committee with representation from all interested countries be established for the purpose of deciding upon a mutually acceptable experimental design and methodological outline, to be adhered to in the conducting of roadside surveys of the BAC's in the driving population." By mutual agreement, it was decided that the activities of this newly-established subcommittee on roadside surveys would be coordinated by Canada.

In March of 1972 the Canadian Government invited interested nations to send delegates to attend a meeting in Ottawa. The purpose of this meeting was to establish basic guidelines for conducting roadside surveys of the distribution of BAC's in the driving population. Positive responses were received from sixteen of the twenty-three invited nations and delegates from six nations attended the four-day meeting. Several nations unable to send delegates presented their views in writing.

The delegates decided that it was both feasible and desirable to conduct internationally comparable roadside surveys. They recognized that participation would mean that individual nations might have to make certain compromises and might have to sacrifice some freedom in carrying out their surveys, but they quickly recognized that comparable international data would more than compensate for this slight loss of freedom. Two main tasks were undertaken by the Ottawa conference.

1. To delineate and specify a basic experimental design and methodological core to be adhered to by all nations participating in the comparative international study. Absolute minimum requirements for roadside surveys were established. Each nation may add to this minimum and new items may be added to the core; however, only information required by the core will be used by each nation to evaluate its own countermeasures program. Data collection times may be altered if such alteration is based on concrete evidence. This would require a pilot study to find the critical times for a particular nation.

2. To construct a list of basic guidelines for conducting roadside surveys. These guidelines are to be made available to those nations desiring to conduct roadside surveys, but the guidelines are not compulsory.

This manual is based on these guidelines and expands them considerably by adding detailed suggestions based on the experiences of the authors.

The major objectives of conducting internationally comparable roadside surveys may be summarized as follows:

1. To be able to increase the epidemiological data base.
2. To be able to compare the effectiveness of countermeasure programs employed in various nations.
3. To provide a sound data base against which changes in any one nation can be adequately interpreted.

During the Ottawa conference, the matter of standardization of BAC measuring techniques for roadside surveys was discussed. The assembled group agreed upon the use of breath as the body material for analysis. The United States representatives agreed to provide standards for this important aspect of the methodology.

The four-day Ottawa conference was successful in reaching agreement on most of the points of design and methodology. Since there were still some aspects which required further discussion, the delegates agreed to hold a two-day meeting in June of 1972 in Paris to conclude the discussion. During the Paris meeting, the methodological core was completed and a description and demonstration of breath testing devices was conducted. All this activity resulted in a publication entitled "Roadside Surveys of Drinking Driving Behaviour; A Review of the Literature and a Recommended Methodology." This publication was prepared and is distributed by the Road Safety Branch, Ministry of Transport of Canada.

The material included in this manual is intended to supplement the Canadian report. The manual will concern itself with:

1. Obtaining a high rate of cooperation from drivers.

2. The accuracy and standardization of information obtained through roadside surveys.

3. The evaluation of drivers who refuse to cooperate.

Because of the very low frequency of high BAC's in the driving public, the loss of a very few samples of drivers who have high BAC's can distort the data obtained enormously. Despite national differences in public attitude and in the laws and law enforcement approach to the problem of the drinking driver, rough guidelines can nevertheless be suggested that will tend to elicit a high rate of cooperation to minimize the effects of the loss of some samples.

There are two factors that seem to be in conflict; first, the need for awareness of the public that the roadside survey will be undertaken along with assurance that information obtained in these surveys will remain highly confidential, and second, the need to keep the roadside survey at a low visibility so that it does not become a countermeasure in itself. These two factors need not be in conflict provided the time during which the driving public is saturated with publicity is somewhat separated from the time when the survey is actually conducted. The theme of the information program must be that everyone's help is needed to obtain important information that might lead to the solution of a major highway safety problem. This must be repeated over and over in personal appearances before civic, professional, and media groups and through widespread publicity on television and radio stations and in the newspapers. If the public information program and the roadside survey are separated by several weeks, or even months, the public tends to forget the information that was disseminated and will behave as usual. However, when a driver is later stopped for interview and breath testing, he will recall the information that he heard weeks or months before. This tends to increase cooperation. In several typical surveys where this approach was used, the rate of refusals was about 3%.

There are other requirements that must be fulfilled in order to ensure that the roadside surveys can be undertaken with the least friction with the community. After all, the roadside survey is an intrusion into the normal activity of the public. The relationship with the police and the legal system is especially sensitive. Certain procedural groundrules must be established. Drivers who are obviously impaired can be arrested and processed in the usual manner or they can be taken home. Confidentiality of information obtained by the roadside survey team must be ensured. The role of the police officer who stops the motorists must be delineated. This means some training of those officers* who will be involved. In most jurisdictions it would be illegal, in fact almost impossible, for anyone other than an officer to stop a motorist for such purposes. All these problems must be solved well in advance of conducting the roadside survey.

If excessive hostility and conflicts with the officials of the community persist, it may be necessary to abandon that community and move on to another. This is one of the reasons why preliminary planning and liaison activities should be undertaken well in advance of the actual survey. These conflicts must not interfere with the actual administration of the roadside survey. A typical set of agreements might be as follows:

1. The role of the officer is to stop the driver and to explain why he was stopped. If the officer, in his initial contact, has reasonable cause to believe that the driver is under the influence of alcohol, the officer may place the driver under arrest and process him in the usual manner. Only after he has been completely processed for driving under the influence of alcohol would he be asked questions for the purpose of completing the research report.

* In the remainder of this manual the term "officer" will refer to an individual empowered to stop a driver. This will normally be a police officer.

2. If the police obtain a BAC, the result of that test should be made available to the research team. If the police fail to obtain such a test, a member of the research team might attempt to obtain a breath sample. The police might agree to supply the BAC's to the research team but policy should prohibit reciprocity. This is in line with the confidentiality of the information obtained for research purposes. If the officer does not notice that the driver is under the influence but a member of the research team does recognize this fact during the interview, an agreement might be reached with the police whereby the research team would see to it that the impaired motorist is taken home. In numerous surveys this arrangement has proven satisfactory:

    1. To the police because a potential hazard has been removed from the road.
    2. To the motorists because they were not arrested and their confidentiality was not betrayed.
    3. To the research workers because through conversation during the ride home information is gained that otherwise would have been missed.

Since in many jurisdictions an officer is necessary to effect the stop, assurance should be obtained from the police agency that an officer will be provided for assistance at the site of the roadside survey when requested. In some cases it may be necessary to hire off-duty officers to carry out this activity.

Since the duties of the officer are merely to stop the car and to inspire cooperation, his demeanor and appearance are of considerable importance. Some care should be taken in selecting police officers with a pleasant appearance and a friendly approach. Whether or not the motorist has prior knowledge of the existence of the survey effort, the approach of the police officer is the first step in obtaining cooperation.

Although several reasons were offered in the foreword to this manual for conducting roadside surveys and for testing motorists for alcohol at roadside, the remainder of this manual will be directed at obtaining standard information for international comparison.

SAMPLE PLANNING

In order to reduce the undesirable effects of high tourism and climatic extremes, the seasons defined as "Spring" and "Autumn" have been chosen. "Spring" is defined as March, April, and May and "Autumn" is defined as September, October, and November. Because of the economic problem involved in collecting large numbers of samples, it was decided that samples be collected on Friday and Saturday nights only. Moreover, the time-of-day period selected for sampling extends from 22.00 hours to 3.00 hours.* Such surveys should be conducted on an annual basis whenever possible.

While such roadside surveys are intended to study the drinking drivers, it is also important that equal emphasis be placed on the non-drinking drivers selected in the survey. It is *only by being considered in this context that the drinking driver can be understood.* Moreover, many drivers who do not have significant BAC's at the time they are interviewed may nevertheless have a tendency to drink and drive. Questions not included in the core may be added to inquire about this possiblity

Drivers will be stopped on a time-interval basis. The length of this interval will be equal to the total processing time for each subject (i.e. if the interview team can handle one person every five minutes, then a driver will be selected from the traffic flow each five minutes).

* Since the Friday night period actually extends into Saturday and the Saturday night period extends into Sunday, these periods will be referred to as period 1 and period 2 for the sampling weeks.

The measure of vehicle flow past each survey site is necessary. This might be carried out at some time prior to the actual sampling period. If the traffic flow is too sparse, these sites may be rejected in advance of the actual sampling. It would be sufficient to obtain a simple time-count of vehicles traveling in the same direction as the vehicles which will be selected for the survey.

Not more than two hours of time should be spent at any one site. If a longer period is necessary for practical reasons in some nations, then only the data from the first two hours should be considered as part of the data for international compariosn. In such a case, the first two hours of testing must fall between 22.00 hours to 3.00 hours.

All motorized vehicles will be sampled including automobiles, trucks, motorcycles, mopeds, etc. The exceptions are commercial vehicles such as buses, large trucks, taxis, small trucks used for commercial purposes, and vehicles bearing foreign registration plates. The purpose of this last exception is to restrict the core sample to the residents of the nation in which the survey is being carried out.

Sample size is difficult to estimate. According to the specifications set out by the expert group, the number of drivers stopped, interviewed, and tested must be large enough to ensure that at least 100 drivers with significant BAC's are included. While there was no specification as to what constitutes "significant BAC's" the authors of this manual consider that this means 80 milligrams of alcohol per 100cc. of blood.* The Canadian report included summaries of sixteen studies. While it was not possible to extract exact figures from these studies, it can be estimated that on the average drivers with 80 BAC or higher comprised 5.5% of the sample obtained. By considering the range within these studies, a standard deviation of 3% was obtained. Thus, <u>on the average</u> 1880 samples would be required to obtain 100 drivers with BAC's

* *In the rest of this manual,* BAC (Blood Alcohol Concentration) will be substituted for "milligrams of alcohol per 100 cc. of blood."

in excess of 80. Summarizing in round figures, it could be anticipated that by taking 2000 samples, 100 drivers with BAC's in excess of 80 could be anticipated. However, applying one standard deviation in either direction, it is possible that the 100 acceptable samples might be obtained within a range of 1000 to 3000 samples. These are rough estimates intended for planning only. Cultural use of alcohol in various nations, the nature of the people who own automobiles, and many other factors will influence this frequency. Plans should be made to continue sampling at least long enough to obtain the required 100 drivers with BAC's in excess of 80. It must be emphasized that these are minimum figures and that larger numbers will clearly have greater stability when comparisons from year to year are to be made.

Samples should be obtained from as many sites as possible, and no site should be visited more than once. While the maximum time at one site is specified as two hours, more frequent moving about has the advantage of increasing the randomization of the process and it also tends to discourage drivers from by-passing the data-collection sites.

For the purpose of international comparison of the statistics resulting from such roadside surveys, only studies of entire nations will be considered acceptable. This does not preclude the sampling of various regions of a nation or the consideration of data from these various regions for internal use within a nation.

SITE SELECTION FOR ROADSIDE ALCOHOL SURVEYS

The site and sample period selection procedures define the population in space and time for which valid statistical inference can be made. A statistician should be consulted to design the particular survey and the associated analysis of the results.

The most satisfactory site selection procedures involve probability samples with stratification. The general procedure is to divide the area of interest into sampling units on the basis of such characteristics as socio-economic data, the functional classification of roads, or similar characteristics. A set of sampling units can be cross-classified into strata on the basis of characteristics such as urban or rural, or primary and secondary highways, and a number of sites can then be assigned to each stratum. A set of particular sample sites is then selected by a random procedure, preferably with alternates so that the alternate site can be utilized if a site is selected more than once. This may involve the selection of more detailed sampling areas within the larger sampling units.

The actual sites can be selected in several ways. For example, they may be selected from complete lists of potential sites, by area selection, and so on. The one essential is that the procedure be such that legitimate inference can be made from data collected at the site back to the characteristics of the population of interest. This in turn requires the use of appropriate random procedures at each stage.

Several problems can be anticipated in advance. The application of the site selection procedures may lead to sites which are not suitable. For instance, night roadside surveys on limited-access high speed highways cannot be undertaken safely. Thus, these facilities should not be included in the population surveyed. However, if information about these facilities is essential, data collection sites can be established at exit points.

Inefficient stratification can waste resources. Thus if each mile of road in an area has an equal chance of being selected as a sample site, then in most areas the majority of sites will represent rural access or residential roads, since these levels of roads usually account for most road mileage. If satisfactory inference is to be made about other classes of roads under this site selection procedure, then a large number of sites will have to be used. Also many sites on these kinds of roads may have volumes which are too low to support sampling. The alternative is to stratify possible sites on class of road or on characteristics of the area to ensure that the required balance is represented in the survey. Also low volume sites can be sampled in both directions of travel, while high volume sites are sampled in one direction of travel only. If this latter course is adopted, the rules governing sampling should be determined in advance and when required, a random selection made for the direction of travel to be sampled.

The importance of having clearly defined objectives as a basis for site selection procedures must be emphasized. Different site selections will be made to facilitate different comparisons. Consequently, efficient survey designs can be derived only if the survey objectives are known and clearly specified in advance. In the current activity, standardization of data is the prime objective.

Finally, the selection of sites and the specification of sampling periods should be considered jointly. Typically, the incidence of significant BAC's varies by hour of day and by day of week. If comparisons are to be made among areas, a pattern of sampling which controls this source of variation through randomization and through balancing is required. If this is not done, effects related to the short time periods become confounded with effects relating to other site characteristics. When this confounding occurs, it is not possible to determine whether the differences observed among areas are associated with the areas themselves or are associated with different time patterns of sampling.

For a typical study the following factors are considered determinative. The geographic area to be studied should include city streets, rural roads, two-lane highways, and four lane high-speed highways. Although the areas being studied should include these various types of roads, streets, and highways, it is possible that some of them cannot be included in the survey because of hazardous conditions or because of insufficient traffic flow to provide an adequate sample in a reasonable span of time. In practice, the actual detailed site selection is carried out by field researchers in advance of data collections. Criteria for the final determination of sites include traffic flow and safety considerations.

SURVEY QUESTIONNAIRE

1 SITE

2 TIME

3 SUBJECT NO.

4 SEX

M F X

5 NO. OF PASSENGERS

6 VEHICLE

1 2 3 4

1. CAR 2. TRUCK 3. MOTORCYCLE 4. OTHER

7 OPINION OF DRINKING

1 2 3 4

1 DEFINITELY 'NO' 2. UNDECIDED 3. PROBABLY 'YES' 4. DEFINITLEY 'YES'

8 PARTICIPATION (Q)

1 2 3

1. AGREES 2. REFUSES 3. REMOVED BY POLICE

9 ORIGIN OF TRIP

1 2 3 4 5 6

10 DESTINATION

1 2 3 4 5 6

1. HOME
2. FRIEND'S HOME
3. WORK
4. RESTAURANT
5. PUB OR BAR
6. OTHER

11 DISTANCE FROM 9 TO 10

12 ESTIMATE OF TRIP TIME

(MINUTES)

13 PURPOSE OF TRIP

1 2 3 4 5 6

1. RECREATION
2. LONG TRIP
3. COMMERCIAL
4. WORK
5. OTHER
6. REFUSED

14 ESTIMATE OF ANNUAL DISTANCE DRIVEN

15 TYPE OF DRIVER LICENSE

1 2 3 4 5

1. OPERATOR 2. PROFESSIONAL 3. NONE 4. OTHER 5. REFUSED

16 OCCUPATION

1 2 3 4 5 6 7 8 9 0

1. BUSINESS
2. PROFESSIONAL
3. STUDENT
4. SALES
5. OFFICE
6. FARMER
7. LABORER
8. TRADESMAN
9. OTHER
0. REFUSED

17 AGE

18 PARTICIPATION (BA)

1 2

BAC

1. AGREES 2. REFUSES

19 INTERVIEWER

Four categories of highways have been mentioned as the basic criteria for interview site selection, namely, city streets, rural roads, two-lane highways, and high-speed multi-lane highways. The geographic area is then divided into cells of some selected dimensions, for instance 500 meters square, by placing a translucent grid over a map of the area. The types of roads within each cell are identified and a numerical designator is assigned which identifies the cell, the type of road, and the roads themselves. The roads are then listed by type within each cell. The cells can then be classified on this basis along with socio-economic, population density, and other factors. Using a table of random numbers, a weighted number of cells can be selected from each class. Following this selection process, the field researchers visit the designated roads and make a physical inspection fo the road segment within the cell. Some sites are not usable due to characteristics which make the stopping of vehicles hazardous. In the event that a site is rejected, an alternate site of the same type is substituted. Resources and time constraints will limit the number of sites that can be visited. (See site survey form)

The core information requirements for a survey for international comparisons dictate that the sampling be done at night. It is therefore important to have available lighting for safety purposes. While the illumination must be adequate to cover the area in which the survey is being conducted, care must be exercised to employ lights that will not blind oncoming motorists. The normal flashing lights mounted on police cars should be used to encourage oncoming motorists to begin to reduce their speed before entering the stopping zone. Some adjustment in the exact site location might be necessary to minimize opportunities for motorists to turn off the road to avoid the survey area. Members of the research team other than the officer should wear clothing that identifies them as researchers. This can be a white laboratory coat or a brightly colored jacket if weather conditions demand.

The important point is to avoid uniforms or other forms of official looking garments. Smoking by the interviewer must be prohibited since it is necessary for him to require the driver to refrain from smoking for a certain period before the breath test is taken.

While the sampling schedule should be adhered to as rigorously as possible, certain conditions will make it prudent or necessary to depart from the schedule in the interest of public safety. The conditions under which sampling would be postponed (e.g., rain, snow, fog, etc.) should be specified as part of the research design. In addition, the individual or individuals authorized to make decisions regarding the postponement of a scheduled sampling should be clearly designated in advance as part of the program management.

SAMPLING AT SITES

After cooperation has been developed with the police and other agencies, the public has been informed, and the sites have been selected, it is the function of the roadside survey team to visit the sites and collect the necessary information.

General information concerning a particular site has been recorded on the site survey form by the researchers who visited the sites after they were selected. This includes the grid designation number, the type of location (i.e. urban, suburban, or rural), altitude, and vehicle count. The site survey form also should include an exact location and description of the site to be used, including the time period, week, month, and year when the site is to be visited and samples are to be taken. Other information must be filled into these site survey forms at the time of arrival for data collection. This includes temperature, precipitation if any, and road conditions.

The survey questionnaire is tied to the site survey form through commonality of "site". The survey questionnaire includes the time of the interview, the subject number, number of passengers, and type of vehicle. The rest of the survey questionnaire is directed at observation and the questions directed at the individual driver.

SITE SURVEY

1 SITE

2 GRID DESIGNATION

3 NATION

4 UNITS OF DISTANCE

1. METRIC 2. ENGLISH

5 TYPE OF LOCATION

1. URBAN 2. SUBURBAN 3. RURAL

6 ALTITUDE

7 VEHICLE COUNT (VEH/HR)

8 SURVEYOR

EXACT SITE LOCATION

____

____

____

____

____

____

9 TIME PERIOD

1. FRI-SAT. 2. SAT.-SUN.

10 MONTH(s)

11 DATES

12 YEAR

13 TEMPERATURE (°c)

±

14 PRECIPITATION

1. CLEAR 2. FOG 3. RAIN 4. SNOW 5. OTHER

The last and most important information is the BAC as determined from a sample of breath provided by the subject. This information can be obtained and recorded by the interviewer. However, in some instances where breath testing devices are employed that are somewhat complex or technical in nature, it may be necessary to separate the analysis of the breath sample and to add a second member to the team for this task. The remaining member of the site data collection team is the officer who is empowered to stop a motorist after he has been selected from the traffic flow and to direct him to the attention of the research team. This officer should very briefly state to the driver that this is not a stop for a violation of the law but rather part of a research program in which his department is cooperating.

The interviewer should quickly approach the driver's door, introduce himself, and present his credentials in the form of an official letter. The interview should be opened by stating the importance of this particular traffic research project and then followed by an offer to answer any questions the driver might have. Once these preliminaries are over, the interviewer should proceed directly into the interview with a very positive approach. The authors strongly recommend that this interview take place in a van especially equipped for this activity. However, the interview can also be conducted without having the driver leave his car. If a van is not available, it may be prudent to interview the driver in the interviewer's car if other persons are in the driver's car who might interfere with the interview. If the interviewer does not encounter resistance, he can complete his forms quickly and then obtain a breath sample. However, should he sense the possibility of hostility toward the questions, he should attempt to obtain a breath sample immediately.

The design of the record form must make it easy for the interviewer to record the information as it is obtained. This form should be single-side if possible. At least the form designed to record the information obtained directly from the subject should be on one side of a sheet. The amount of longhand writing should either be kept at a minimum or eliminated entirely. A suggested form of this type is appended. Only one form should be on the interviewer's clipboard when he approaches the driver. This will relieve the feeling that the interview will be long and laborious. Also, the subject being interviewed tends to be more at ease if the interviewer is not recording a great deal of information in longhand.

The training of the officer who effects the stop of the motorists at the direction of the interviewer is most important in obtaining cooperation from drivers. This training should emphasize the research aspects of the project as opposed to its enforcement potential. This principle is often difficult to impart to the officer because it represents an approach that may be alien to his professional training and practice. He should be made aware of the circumstances under which he may make an arrest of a driver if he feels duty-bound to do so. It is important that the ultimate BAC results obtained by the police be made available to the research team. After all, regardless of the interview information obtained, the frequency of BAC's in the driving public as measured by the roadside survey is the essential and basic information required. In the training of these officers it should be strongly impressed on them that they must remain in the background as much as possible. The inter-relation between the interviewer and the interviewee must be unimpeded by the presence of the officer.

When the interview has been completed, it is the responsibility of the officer to see to it that the motorists who has been stopped is guided safely back into the traffic flow.

Training the interviewers is a much more complex function. One of the prime objectives in the roadside survey is to minimize the number of refusals. The rates of refusal in various projects have ranged from 1% up to 15%. When one considers the rarity of high BAC's in the driving public, the importance of obtaining a nearly complete sample is very obvious.

A primary principle of interview is that the interviewer match his personality and adjust his approach to the nature of the subject being interviewed. This means a flexible approach.

Although standard information is a goal of the project, the information recorded must be standardized but the methods of getting this information may vary considerable according to the nature of the person being interviewed. Thus the approach becomes modified-directed. A directed interview would mean strict adherence to a questionnaire even though the subject does not respond well to this simple type of approach. The directed type of interview must be modified somewhat to elicit high cooperation from those individuals who otherwise might not cooperate fully. The interviewer should realize that the accuracy of subjective material such as that obtained in roadside surveys will be dependent on human limitations of memory and judgment. The person being interviewed will not always be able to give an obviously accurate account of his habits. Some drivers will inadvertently shade subjective information while others may find it impossible to be totally candid in discussing habits such as those involving the use of alcohol. Religious, social, and cultural mores often make it difficult for the subject to admit to violations of what he might consider taboo. The interviewer must appear neutral as far as moral judgments are concerned. Any indication of disapproval of the driver's responses in the attitude of the interviewer will immediately create a barrier to communication.

The interviewer should make it a practice to tell the subject that a refusal to answer is better than a misleading answer. Internal crosschecks in the questionnaire make it possible to assess the validity of the answers obtained.* The film that is intended to supplement this

* The nature of the suggested interview form, the training of the interviewers, and the classifications of interviewees has adapted from the techniques used by the late Dr. Alfred Kinsey in his study of sexual behavior.

manual will acquaint the interviewer with the various types of individuals that are likely to be encountered.

The technique of training employed in one massive survey utilized tape recording of role playing by the interviewers. They alternately took the role of interviewer and interviewee. Criticism of the resulting tapes afforded feedback for improving their technique.

Subjects being interviewed in roadside surveys tend to fall into rather definite categories. The first major sub-division is, "Has the subject been drinking or has he not been drinking?" There should be a place on the interview form where the subjective opinion of the interviewer can be recorded. If this is done in each interview before the interviewer knows the results of the breath test the validity of his judgment can be projected to the subjects who refused to cooperate. Thus some evaluation can be made as to the frequency of evidence of alcohol in those subjects who do refuse completely. The model form appended suggests four categories:

1. Definitely not drinking.
2. Unable to decide.
3. Probably has been drinking.
4. Definitely has been drinking.

This subjective judgment should be recorded in every interview as soon as the introductory statements have been made by the interviewer. In this manner the judgment will be standardized whether the subject cooperates or refuses. This information is extremely important in evaluating refusals. By including it in every interview, the level of confidence that can be placed in these subjective judgments can be determined.

Beyond this first subjective judgment, drivers can be classified into the following groups:

1. The cooperative person. This type of subject offers no problem and the interview form can be used exactly as it appears followed by the taking of the breath sample.

2. The timid person. This type of subject presents a very real problem in that each response must be pried from him. To deal with this type of individual effectively requires patience and the use of considerable tact. They must continually be reminded that all information obtained in the interview is confidential. The internal cross-check included in the interview form can be of considerable importance in evaluating the truthfulness of the responses from this type of driver.

3. The talkative person. When dealing with the talkative person all that is necessary is to mention a few key words to start the flow of information. All the interviewer has to do is to recognize the answers he is seeking and to record them as the subject talks. At the end of the interview the interviewer should ask any questions that have not been answered in the flow of conversation. It is this type of interviewee that makes necessary the modified-directed form of the interview. He may present the answers out of the sequential order included in the interview form but this is of little importance provided the answers fit the categories included in the form.

4. The belligerent person. Of all the types he is the most difficult and challenging to interview. If the interviewer stays calm in spite of some possible insulting or belittling remarks, the driver will often calm down. Repeating to him the importance of the nature of the research to highway safety and how he can contribute to it will often pacify him. However, if all else fails, an attempt should be made to obtain a breath sample.

5. The driver who cooperates in answering the interview questions but who flatly refuses to give a breath sample. He will argue that why should he give a sample when he has not been drinking. This sometimes can be overcome by stressing the importance of negative controls in the data.

6. The driver who completely refuses to answer questions or to submit a breath sample in spite of all efforts by the interviewer. Even in such cases a few bits of information can nevertheless be obtained before the driver is permitted to continue on his way. At least sex and approximate age and subjective judgment as to whether alcohol is present in the individual can be obtained.
7. The driver who is in a hurry. This is very frequently a valid excuse. If in the opinion of the interviewer the excuse is valid, a breath sample should be elicited and the telephone number of the driver obtained with the notion that he will be interviewed by telephone the next day. This type of excuse is common when samples are taken during the daytime hours. However, since the international survey is directed at night time driving, the frequency of this excuse should be quite low.

The tape recording role playing mentioned earlier can help develop the interviewer's skill and a feeling of confidence in coping with the different types of persons who will be encountered. Such sessions will also acquant the interviewers with the questionnaire form. If the technique of asking questions is performed skillfully, answers tend to be spontaneous and false answers can be held to a minimum because of the interlocking nature of the questions and the speed with which they are presented. Skill developed through this type of training will also play a major role in holding the number of refusals to a minimum.

The training of the breath alcohol technician is completely dependent upon the nature of the testing device employed. The standards for such devices are treated in another section of this manual. However, it is appropriate at this point to mention that one of three approaches may be used;

1. A quantitative breath alcohol testing instrument installed in a mobile van. This approach has the advantage of making possible the control of environmental factors as the van can

be air conditioned or heated as necessary. This method also eliminates the possibility of not obtaining a BAC through loss or destruction of stored breath samples as the results are obtained and can be recorded immediately after the interview. However, this method does make it necessary to remove the driver from his vehicle to the van where the interview and breath test are carried out.

2. The handheld quantitative breath alcohol device. This type of instrument can be removed from the research vehicle and can be taken to the window of the vehicle of the driver being interviewed. It has the advantage of not requiring the removal of the driver from his vehicle for testing; however, extremes of environmental conditions can have some effects on the validity of the resulting answers. In most instances where there are other passengers in the vehicle, it is advisable to remove the driver from the vehicle to prevent passenger interference and influence on the driver's responses to survey questions.

3. The use of a remote collection device. This involves collecting a sample of breath from the subject and preserving it per se or collecting a breath sample and preserving the alcohol from a measured quantity of breath for subsequent analysis. This approach is subject to the same environmental factors as the quantitative devices used in the van or at the side of the driver's vehicle. It has the distinct advantage of not making the results of the test immediately available. This extends the confidentiality of the information that is obtained from the driver and precludes some of the problems that evolve from having an immediate answer available. This may be a factor in minimizing the the number of refusals, especially when a subject has been drinking.

It is the nature of the test being employed that will dictate whether the interviewer himself will carry out the breath alcohol determination or whether a technician must be fully trained in the operation and care of the breath alcohol test equipment in use by him. He should be aware of the environmental and biological factors that can cause erroneous results. Special attention should be given to the ambient temperature at which the test is being conducted and the problems relating to mouth alcohol. It is important that the team have back-up breath testing equipment available should there be an unexpected failure of the breath testing unit being used.

INSTRUMENT STANDARDS

Biological Specimen

The biological specimen of choice for the determination of alcohol concentration is breath. Blood, tissue, or urine samples may be gathered in addition, but are not acceptable as substitutes for breath samples.

Results of breath alcohol analysis shall be reported in terms of BAC, based on milligrams of alcohol per 210 liters of deep-lung air. Using this system, "100" is equal to "0.10% BAC w/v" or "1.00°/oo w/v." If an instrument displays only two digits, the third shall be a "0".

Breath Testing Device

The breath specimen analyzed shall be expired deep-lung air. This is any phase of the breath that follows the first 0.5 liter of an exhalation. Determination of the BAC shall be based on the ratio between alcohol present in the blood and whole deep-lung air, using either a known volume or a continuous flow system. Indirect determination of the BAC by quantitative breath alcohol analysis shall be based upon the following ratio: 2.1 liters of expired deep-lung air contains the same quantity of alcohol as one milliliter of blood.

1. The instrument must indicate a value of within ± 10% of the target value when the target value is 100 mg. of alcohol per 100 ml. of blood, and at least 500 ml. of

air must be expired by the subject before a breath sample is taken for the purpose of analysis (the reason for this is to ensure that a deep-lung sample is obtained). For those breath testing devices which do not control the amount of air which is expired before the sample is taken, a simple plastic bag placed along the air intake tube would ensure that the minimum amount of air had been expired before the sample was taken.

Loss of alcohol (from the breath specimen) through condensation shall be prevented by maintaining the breath specimen at a temperature sufficiently above body temperature, or by other satisfactory means.

In the analysis of vapors of known alcohol concentration over the range corresponding to BAC's of 50 to 300, the instrument must be capable under field conditions of determining the BAC equivalent of the true value to within - 10% of the true value.

When vapors of known alcohol concentration over the range corresponding to BAC's of 50 to 150 are analyzed, under laboratory conditions, the results of a minimum of 50 consecutive determinations at any one concentration must have a standard deviation (sigma) not greater than 3. When vapors of known alcohol concentrations over the range corresponding to BAC's of 150 to 300 are analyzed, under laboratory conditions, the standard deviation (sigma) of a minimum of 50 consecutive determinations at any one concentration must not exceed 2% of the expected value.

The instrument must be capable of performing a blank analysis on ambient air, free of alcohol, that yields an apparent BAC of no more than 10.

Instruments which singly or in combination collect a deep-lung air sample and temporarily store the specimen or its contained alcohol for subsequent analysis (remote sampling devices), shall meet all stated performance requirements. Such instruments shall be designed so that the result obtained is independent of barometric pressure or designed so that the result obtained is independent of barometric pressure or designed so that the results obtained is correctable for barometric pressure change if such correction is necessary.

A means must be employed to ensure that the subject has not ingested alcohol for at least ten minutes prior to collection of the breath specimen. The following alternative is suggested:

1. Collect the specimen at the end of the interview. This will allow about five minutes of continuous observation during which the subject must not drink either an alcoholic or non-alcoholic beverage, or eat food. He should not smoke for at least one minute before the sample is collected.
2. If the result is positive and the subject assures that he has had no alcoholic beverage for at least twenty minutes, the answer can be accepted.
3. If the subject affirms that he has consumed an alcoholic beverage within the last twenty minutes, a second test should be administered after allowing an additional five minutes. The second test should be recorded. This step should rarely be necessary.
4. If the answer is negative, the result can be accepted without question.

The testing procedure will include the analysis of a suitable reference or control sample such as air equilibrated with a reference solution of known alcohol content at a known temperature, the result of which analysis must agree with a .100 BAC reference sample within the limits of $\pm$ .010 BAC. Frequency of such monitoring of accuracy shall be dependent on the stability of the method employed.

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3. Perrine, M.W. Methodological considerations in conducting and evaluating roadside research surveys. U.S. Department of Transportation, NHTSA Technical Report, 1971 (Feb.), DOT HS-800 471, 138 p.

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APPENDIX E

INTERNATIONAL CONFERENCE ON RESEARCH METHODOLOGY FOR ROADSIDE SURVEYS OF DRINKING-DRIVING

ANNOUNCEMENT

A three-day workshop dealing with roadside surveys of drinking driver behavior as one of the effective measurements of programs in combating the drinker-driver problem.

TO BE HELD: May 22-24, 1974
Meridien Hotel, Paris, France

HOST: Association Internationale Pour L'Etude Du Comportement Des Conducteurs

CONDUCTED BY: Committee on Alcohol and Drugs

SPONSORED BY: Office of Alcohol Countermeasures, National Highway Traffic Safety Administration

STATEMENT OF OBJECTIVE

Data Needed on Drinking Drivers

Drinking drivers contribute to the highway safety problem. They violate traffic laws and become involved in motor vehicle traffic accidents. Although some data are available on the extent to which drinking drivers are involved in violations and accidents, the extent of the drinking-driver problem is not fully known.

Highway safety program officials, and others involved with the drinking-driver problem, need to know more about the type of person who drinks and drives, including the time of day, the day of the week, and other related information which would be helpful in developing measures designed to reduce alcohol abuse in highway traffic. What is needed are adequate and accurate data on the alcohol-impaired drivers using the highways.

Arrests and prosecutions for traffic law violations and investigations of motor vehicle traffic accidents provide part of the needed data. Properly administered, they also are effective countermeasures.

Roadside Surveys Develop Data

Roadside surveys of drinking-driver behavior have produced data on the problem, but they have been too few and have had little comparability. What is needed is agreement on data needs, methodology of surveys, blood alcohol concentration measurements, standard international reporting, and other similar information. When these needs become realities; meaningful countermeasures become possibilities.

The National Safety Council's Committee on Alcohol and Drugs, an international group concerned with the alcohol abuse problem, has furthered the use of roadside research surveys to obtain more data on the drinking-driver problem. Several members of the Committee have been active in surveys in Canada and the United States.

Furthering Roadside Survey Efforts

The Committee on Alcohol and Drugs, recognizing the work that has been accomplished by several countries, decided to further the efforts of the Ottawa and Paris conferences on surveys in 1962 by developing and demonstrating surveys in workshops.

Accordingly, the Committee, National Safety Council and the U.S. Department of Transportation's Office of Alcohol Countermeasures developed a contract to conduct roadside survey workshops in Europe, utilizing experienced members of the Council's Committee on Alcohol and Drugs. The Council obtained the services of the International Drivers' Behaviour Research Association to host the first workshop in Paris on May 22-24, 1974 at the Meridien Hotel.

Roadside Survey Workshop Team

The roadside survey workshop team will develop a manual on methodology and make a workshop presentation utilizing the objectives and recommendations of the Ottawa and Paris conferences as outlined in Carl M. Stroh's, Roadside Surveys of Drinking-Driver Behavior: A Review of the Literature and a Recommended Methodology, September, 1972.

The workshop presentations will synthesize the progress made in roadside surveys and emphasize methodology, data sources, types of surveys, international standard reporting and the measuring of blood alcohol concentrations.

The members of the Committee on Alcohol and Drugs are glad to have a part in furthering this international effort. Our roadside survey workshop team and staff of the National Safety Council look forward to a profitable three-day workshop with you in Paris. The team and staff include:

Professor Robert F. Borkenstein, Indiana University, Bloomington, Indiana

Dr. M. W. Perrine, University of Vermont, Burlington, Vermont

Mr. Lowell C. Van Berkom, Minnesota Department of Public Safety, St. Paul, Minnesota

Mr. Elbert Hugunin, National Safety Council, Chicago, Illinois

We hope that you can accept the invitation to participate in this important international effort to further the development of data on the drinking-driver problem.

Robert H. Reeder, Chairman,
Committee on Alcohol and Drugs

Robert H. Reeder
General Counsel
Traffic Institute
Northwestern University
405 Church Street
Evanston, Illinois 60204

APPENDIX F

2.2.4 France

MR. J. L'HOSTE

2.2.5 The Netherlands

MR. PETER C. NOORDZIJ

2.2.6 Other Nations

(To be announced)

THURSDAY 23 MAY 1974

9:30 METHODOLOGY OF ROADSIDE SURVEYS

1 Restatement of Needs

PROFESSOR M. W. PERRINE

2 Alcohol Data Sources

DR. J. D. J. HAVARD

2.1 Mortality
2.2 Morbidity
2.3 Enforcement
2.4 Roadside Surveys

10:30 Intermission

10:50 3 Preliminary Activities and Planning

PROFESSOR M. W. PERRINE

3.1 Consideration of Local Constraints
3.2 Relations with Community
3.3 Relations with Police
3.4 Site Selection
3.5 Sample Size
3.6 Questionnaire Development and Pretest
3.7 Personnel Requirements
3.8 Training of Personnel
3.9 Equipment Considerations

12:00 Lunch

14:00 4 Conducting the Roadside Survey

PROFESSOR M. W. PERRINE

4.1 Vehicle Selection
4.2 Safety Considerations
4.3 Stopping Procedures
4.4 Interview Procedures

4.4.1 The Team
4.4.2 Data Forms (Standard Forms and Nomenclature)
4.4.3 Obtaining Cooperation
4.4.4 Scope of Interview
4.4.5 Preliminary Impressions and Estimate of BAC

4.5 Evaluation of Refusals
4.6 Termination of Roadside Operations

16:00 Intermission

16:30 5 BAC Measurements

MR. LOWELL C. VAN BERKOM

5.1 Survey of Types of Instruments
5.2 Precision
5.3 Accuracy
5.4 Applicability to Roadside Surveys
5.5 Quality Control

18:00 Reception and Demonstrations

FRIDAY 24 MAY 1974

9:30 DEMONSTRATION OF ROADSIDE SURVEYS

1 Restatement of Operations

MR. LOWELL C. VAN BERKOM

2 Introduction of Film

3 Demonstration of Film

4 Critique of Roadside Survey Film

5 General Discussion

6 Workshop Closing

MR. T. E. A. BENJAMIN
MR. ELBERT HUGUNIN

APPENDIX G

U.S. DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

Office of Alcohol Countermeasures
Washington, D.C. 20590

Appendix G-1

Alcohol Safety Action Projects

EVALUATION OF OPERATIONS - 1972
VOLUME II DETAILED ANALYSIS

Chapter 2 ASAP Program Evaluation Methodology and Overall Program Impact

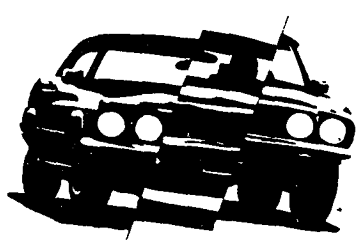
SECTION V

RESULTS OF ROADSIDE VOLUNTARY SURVEYS

This is one of seven chapters in the Alcohol Safety Action Program publication. The seven chapter titles are:

1. Development and Management of the ASAP Program
2. ASAP Program Evaluation Methodology and Overall Program Impact
3. Evaluation of the Enforcement Countermeasure Activities
4. Evaluation of the Judicial and Legislative Countermeasure Activities
5. Evaluation of the Pre-Sentence Investigation and Probation Countermeasure Activities
6. Evaluation of the Rehabilitation Countermeasure Activities
7. Evaluation of the Public Information and Education Countermeasure Activities

DOT HS 800 874



SUMMARY OF RESULTS OF ROADSIDE VOLUNTARY SURVEYS CONDUCTED AT 19 ALCOHOL SAFETY ACTION PROJECTS

by

Robert B. Voas

As indicated in the chain of action analysis, if an alcohol countermeasures program is to have an impact on crashes, it must achieve that impact by reducing the number of drivers on the road at high blood alcohol concentrations. Roadside voluntary surveys of blood alcohol concentrations in drivers provide a method of determining whether this has occured (16, 24). These surveys provide the project evaluator with a method of measuring the "unprecipitated" event; the number of accidents waiting to happen. Presumably if the numbers of drivers operating on the roadway at high risk due to alcohol are reduced, then the numbers of alcohol-related crashes will be reduced.

By the date of this report, 19 of the 29 ASAP projects covered in this report had conducted at least two voluntary roadside surveys. Figures 41 and 42 summarize the results from those 19 pairs of surveys. The distribution of the first of these 19 pairs of surveys is given in Figure 43. As can be seen from this figure most of the project results fell within a fairly small range of BAC values. The percentage of negative drivers ranged between 62 and 79 percent, with the exception of two projects. These two, Portland, Oregon and Seattle, Washington, were handled by the same evaluation agency. Apparently their instrumentation or measuring technique gave them a large number of low positive readings (.01 percent BACs), with a result that these projects reversed the trend of the other 17 sites. The difficulty of calibrating and reading the breath testing devices accurately at the .00 percent and .01 percent levels was avoided in most other projects by combining .01 percent readings with the negative category rather than adding them to the .01 percent to .04 percent category. This departure from the levels shown in the other projects is accentuated by the size of this lowest blood alcohol interval from .01 percent to .04 percent. Any measurement not zero falls into this category. To minimize this problem in the analysis of the data submitted, the "negative" and .01 percent to .04 percent categories were combined for all comparisons described below.

The proportion of drivers in the .05 percent to .09 percent interval varied from approximately 6 to 11 percent. Oklahoma City was slightly, but not significantly, outside the group range. In the .10 percent to .14 percent interval the proportion of drivers ranged from 2 to 5 percent, with one notable exception, San Antonio. San Antonio made a special effort to choose its sites based on the occurrence of single vehicle fatal crashes. Its results are probably, therefore, a more selective sample of the nighttime drivers than that obtained at other sites. This may account in part for the atypical results they achieved. At the .05 percent interval, Columbus, Georgia falls to zero and no individuals with BAC levels above this point were detected in their survey. An explanation for this unusually low finding is not immediately available. The most deviant result of this group of 19 surveys is the one conducted by the Albuquerque, New Mexico ASAP. At this project they found an unusually large number of very high BAC readings. Their data appears to either reflect an instrument error or the possibility that they selected by chance a number of individuals who had been drinking very recently, so that mouth alcohol affected the readings obtained.

Aside from these few deviants the similarity of the results is striking and indicates that the number of individuals on the road is generally similar from one geographical area to another. Considering that these results 1) come from widely spaced geographical areas; 2) represent both urban and rural areas; and 3) that this was the first survey made at each project and, therefore, most of those who took part were inexperienced, the relatively good agreement in results is both surprising and important. The results suggest that the roadside survey technique is a measurement which most evaluation specialists can use effectively. The results also suggest that there is considerable consistency in drinking-driving levels from community to community within the United States.

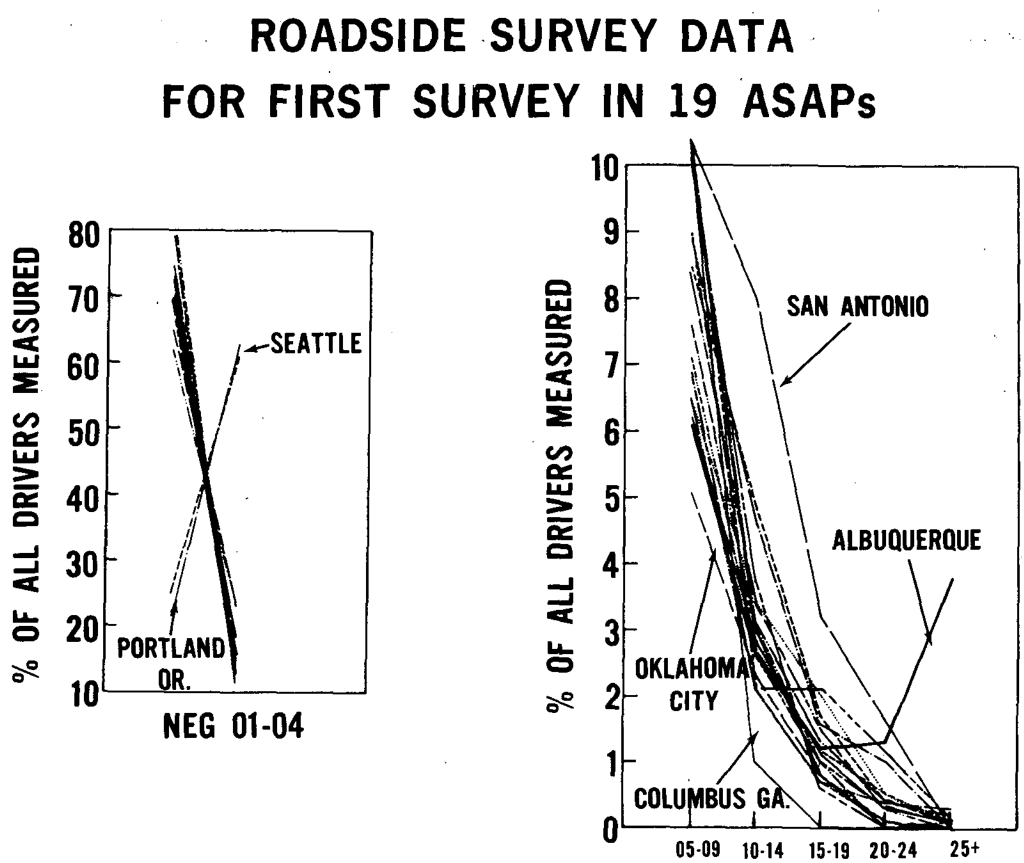
SUMMARY OF RAW DATA FROM 19 ASAPS WHICH CONDUCTED TWO ROADSIDE SURVEYS

ASAP Projects	#	Date	Vehicles Stopped	Drivers Measured	Negative COL5/COL4	01-04 COL6/COL4	05-09 COL7/COL4	10-14 COL8/COL4	15-19 COL9/COL4	20-24 COL10/COL4	25+ COL11/COL4
Albuquerque, NM	1	5/71	921	863	616	118	53	22	10	11	33
	2	5/72	899	850	579	109	73	40	27	10	12
Charlotte, NC	1	10/70	845	766	561	115	58	23	8	0	1
	2	10/71	806	728	550	96	55	21	5	1	0
Portland, OR	1	4/71	607	519	133	312	52	19	3	0	0
	2	5/72	628	559	282	232	33	9	3	0	0
Seattle, WA	1	11/71	607	500	108	316	57	15	4	0	0
	2	6/72	611	525	195	273	44	11	1	1	0
Vermont	1	5/71	544	522	314	124	58	16	7	2	1
	2	10/71	111	109	68	26	10	3	2	0	0
Washtenaw Co., MI	1	3/71	875	746	559	111	46	22	6	2	0
	2	3/72	1,132	1,020	773	148	55	30	11	2	1
Total	1		4,399	3,916	2,291	1,096	324	117	38	15	35
	2		4,187	3,791	2,477	884	270	114	49	14	13
Columbus, GA	1	10/71	706	634	413	148	67	6	0	0	0
	2	10/72	793	737	538	110	67	20	2	0	0
Fairfax Co., VA	1	1/72	1,743	1,578	1,116	293	101	44	18	5	1
	2	10/72	1,687	1,512	969	356	124	48	8	6	1
Indianapolis, IN	1	11/71	650	608	437	73	54	28	10	6	0
	2	11/72	640	602	429	91	42	30	4	5	1
Kansas City, MO	1	10/71	1,117	986	695	157	83	33	15	3	0
	2	10/72	706	656	465	108	44	27	10	0	2
Lincoln, NB	1	11/71	927	773	612	89	50	16	5	1	0
	2	11/72	741	683	515	107	47	9	4	1	0
Tampa, FL	1	1/72	816	794	578	104	65	27	16	4	0
	2	7/72	434	427	327	40	22	25	10	3	0
New Orleans, LA	1	11/71	895	797	391	283	96	17	9	1	0
	2	11/72	856	747	452	197	66	26	4	2	0
Oklahoma City, OK	1	9/71	1,756	1,588	1,171	287	81	36	11	2	0
	2	8/72	1,916	1,741	1,412	192	102	25	10	0	0
Maine	1	11/71	877	700	533	94	48	15	5	3	2
	2	11/72	883	737	562	117	43	12	3	0	0
Pulaski Co., AR	1	11/71	1,270	1,216	813	246	109	32	12	3	1
	2	11/72	820	803	570	130	71	27	5	0	0
Richland Co., SC	1	11/71	890	808	565	149	57	22	10	4	1
	2	11/72	852	802	557	155	61	21	7	0	1
San Antonio, TX	1	11/71	913	634	414	68	70	51	20	11	0
	2	11/72	685	653	393	109	81	37	24	7	2
South Dakota	1	12/71	857	814	567	121	69	39	14	3	1
	2	2/72	2,308	1,978	1,446	299	166	47	12	7	1
Total	1		13,417	11,930	8,305	2,112	950	366	145	46	6
	2		13,321	12,078	8,635	2,011	936	354	103	31	8
TOTAL GROUP	1		17,816	15,846	10,596	3,208	1,274	483	183	61	41
TOTAL GROUP	2		17,508	15,869	11,082	2,895	1,206	468	152	45	21

SUMMARY OF RESULTS IN PERCENTAGES FROM ROADSIDE SURVEYS AT 19 ASAP SITES

ASAP Projects	#	Date	% of Drivers Measured	Negative COL5/COL4	01-04 COL6/COL4	05-09 COL7/COL4	10-14 COL8/COL4	15-19 COL9/COL4	20-24 COL10/COL4	25+ COL11/COL4	.05+ COL7-11/COL4	.10+ COL8-11/COL4	.15+ COL9-11/COL4
Albuquerque, NM	1	5/71	.937	.714	.137	.061	.026	.012	.013	.038	.150	.087	.063
	2	5/72	.946	.681	.128	.086	.047	.032	.012	.014	.191	.105	.058
Charlotte, NC	1	10/70	.907	.732	.150	.076	.030	.010	.000	.001	.118	.042	.012
	2	10/71	.903	.756	.132	.076	.029	.007	.001	.000	.113	.037	.008
Portland, OR	1	4/71	.855	.256	.601	.100	.037	.006	.000	.000	.143	.042	.006
	2	5/72	.890	.505	.415	.059	.016	.005	.000	.000	.081	.022	.005
Seattle, WA	1	11/71	.824	.216	.632	.114	.030	.008	.000	.000	.152	.038	.008
	2	6/72	.859	.371	.520	.084	.021	.002	.002	.000	.109	.025	.004
Vermont	1	5/71	.960	.602	.238	.111	.031	.013	.004	.002	.161	.050	.019
	2	10/71	.982	.624	.239	.092	.028	.018	.000	.000	.138	.046	.018
Washtenaw Co., MI	1	3/71	.853	.749	.149	.062	.030	.008	.003	.000	.102	.040	.011
	2	3/72	.901	.758	.145	.054	.029	.012	.002	.001	.086	.043	.014
Total	1		.890	.585	.280	.083	.030	.010	.004	.009	.135	.052	.023
	2		.905	.646	.233	.071	.030	.013	.004	.003	.121	.050	.020
Columbus, GA	1	10/71	.898	.651	.233	.106	.010	.000	.000	.000	.115	.010	0.000
	2	10/72	.929	.730	.149	.091	.027	.003	.000	.000	.121	.030	.003
Fairfax Co., VA	1	1/72	.905	.707	.186	.064	.028	.011	.003	.001	.107	.043	.015
	2	10/72	.896	.641	.235	.082	.032	.005	.004	.001	.124	.042	.010
Indianapolis, IN	1	11/71	.935	.719	.120	.089	.046	.016	.010	.000	.161	.072	.026
	2	11/72	.941	.713	.151	.070	.050	.007	.008	.002	.136	.066	.017
Kansas City, MO	1	10/71	.883	.705	.159	.084	.034	.015	.003	.000	.136	.052	.018
	2	10/72	.929	.709	.165	.067	.041	.015	.000	.003	.127	.060	.018
Lincoln, NB	1	11/71	.834	.792	.115	.065	.021	.007	.001	.000	.093	.029	.008
	2	11/72	.922	.754	.157	.069	.013	.006	.002	.000	.089	.021	.007
Tampa, FL	1	1/72	.973	.728	.131	.082	.034	.020	.005	.000	.141	.059	.025
	2	7/72	.984	.766	.094	.052	.059	.023	.007	.000	.141	.089	.030
New Orleans, LA	1	11/71	.891	.491	.355	.121	.021	.011	.001	.000	.154	.034	.013
	2	11/72	.873	.605	.264	.088	.035	.005	.003	.000	.131	.043	.008
Oklahoma City, OK	1	9/71	.904	.737	.181	.051	.023	.007	.001	.000	.082	.031	.008
	2	8/72	.909	.811	.110	.059	.014	.006	.000	.000	.079	.020	.006
Maine	1	11/71	.798	.761	.134	.069	.021	.007	.004	.003	.104	.036	.014
	2	11/72	.835	.763	.159	.058	.016	.004	.000	.000	.079	.020	.004
Pulaski Co., AR	1	11/71	.958	.669	.202	.090	.026	.010	.003	.001	.129	.040	.013
	2	11/72	.979	.710	.162	.088	.034	.006	.000	.000	.128	.040	.006
Richland Co., SC	1	11/71	.908	.699	.184	.071	.027	.012	.005	.001	.116	.046	.019
	2	11/72	.941	.695	.193	.076	.026	.009	.000	.001	.112	.036	.010
San Antonio, TX	1	11/71	.694	.653	.107	.110	.080	.032	.017	.000	.240	.129	.049
	2	11/72	.953	.602	.167	.124	.057	.037	.011	.003	.231	.107	.051
South Dakota	1	12/71	.950	.697	.149	.085	.048	.017	.004	.001	.155	.070	.022
	2	2/72	.857	.731	.151	.084	.024	.006	.004	.001	.118	.034	.010
Total	1		.889	.696	.177	.080	.031	.012	.004	.001	.127	.047	.017
	2		.907	.715	.167	.078	.030	.009	.003	.001	.119	.041	.012
TOTAL GROUP 1			.889	.669	.202	.080	.031	.012	.004	.003	.129	.049	.018
TOTAL GROUP 2			.906	.698	.182	.076	.030	.010	.003	.001	.119	.043	.014

FIGURE 43



Comparison of First and Second Roadside Surveys. Normally, a year elapsed between the first survey conducted by an ASAP, usually just before but occasionally just after the project was initiated, and the second survey which normally occurred towards the end of the first project year. Thus, a downward shift in the average BAC level on the second survey would provide evidence that the project's activities during the interim between the first and second survey did have some impact on the number of drinking drivers using the road. To test this hypothesis, the data from the 19 pairs of surveys available from the 29 ASAPs (Figure 41) were compared. These data are presented in Figures 44 and 45. The hypothesis to be tested was that the number of drivers with negative or significant (.01 percent to .04 percent) BACs would increase in the second survey, while the number of drivers at BACs .05 percent and above would decrease. The data for all

FIGURE 44

SUMMARY OF ROADSIDE SURVEY DATA FOR 19 ASAPs*

A. UNWEIGHTED DATA

BAC	Survey First	Survey Second	Total
Below .05%	13804	13977	27781
.05 to .10%	1274	1206	2480
.10 to .15%	483	468	951
Above .15%	285	218	503
Total	15846	15869	31715

CHI SQUARE = 12.3

$P < .01$

B. WEIGHTED DATA

BAC	Survey First	Survey Second	Total
Below .05%	13728	13908	27636
.05% to .10%	1340	1217	2557
.10% to .15%	500	496	996
Above .15%	291	237	528
Total	15859	15858	31717

CHI SQUARE = 12.5

$P < .01$

*See Figure 41 for list of ASAPs. Albuquerque excluded.

19 pairs of surveys were pooled. The data for the comparison of the 19 projects are presented in Figure 44a. As can be seen, a total of 15,846 drivers were sampled in the first 19 surveys, while 15,869 were sampled in the second survey. It was possible to compare the distributions from these two sets of surveys. The data were grouped into four categories: less than .05 percent, .05 percent to .09 percent, .10 percent to .14 percent, and equal or above .15 percent. The Chi Square Test for the difference between the distributions of the first d second surveys was 12.3 which is significant beyond the P = .01 percent level (i.e., there is less than 1 chance in 100 that these results could be accounted for by random fluctuations).

FIGURE 45

SUMMARY OF ROADSIDE SURVEY DATA FOR 18 ASAPs*

A. UNWEIGHTED DATA

BAC	Survey First	Survey Second	Total
Below .05%	13070	13289	26359
.05 to .09%	1221	1133	2354
.10 to .14%	461	428	889
Above .15%	231	169	400
Total	14983	15019	30002

CHI SQUARE = 15.7

P < .01

B. WEIGHTED DATA

BAC	Survey First	Survey Second	Total
Below .05%	13018	13232	26250
.05% to .09%	1289	1145	2434
.10% to .14%	479	457	936
Above .15%	237	188	425
Total	15023	15022	30045

CHI SQUARE = 16.2

P < .01

*See Figure 41 for list of ASAPs. Albuquerque excluded.

Because of the unusually high BACs obtained in the Albuquerque survey, due apparently to an instrumentation or procedural error, it was possible that this survey might be a spurious cause for this significant result. To test for this possibility, the pair of surveys for this project was dropped from the analysis and the Chi Square Test rerun on the basis of the 18 remaining pairs (Figure 45a). With Albuquerque eliminated, the Chi Square value for the two distributions was larger (15.7) and, therefore, even more statistically significant.

The other projects which show up as deviants in Figure 43 were also examined to determine if they could account for this reduction. San Antonio showed no difference between the first and second survey. Thus, this project, even though higher than the others in the number of drivers at significant BACs, did not overly influence the group result. Columbus, Georgia, another deviant on the first survey, increased in the number of drinking drivers so this project worked against the group result. Overall, it does not appear that this group reduction can be accounted for by changes in the few deviant projects.

While the guidelines for the conducting of roadside surveys suggested that a minimum sample of approximately 800 drivers be obtained, there was considerable variation from project to project in terms of the number of drivers measured. Thus, while the total number of drivers in the first 19 surveys was almost identical with the total number of drivers in the second 19 surveys, the contribution from various ASAPs to these totals varied. Therefore, it is possible that some significance in the Chi Square Test was contributed as a result of differential weighing of different projects. To determine what the difference would be if all projects were weighted equally, the obtained frequencies for each project were corrected to a common base of 834, which was the average number per ASAP when the total number of measures in the first survey (15,846) was divided by the number of projects (19). Figures 44b and 45b present these data for 19 and 18 projects respectively. The Chi Square Test was repeated on these weighed sums. The results were even more significant than for the unweighted data presented in Figures 44a and 45a. Thus, the reduction in proportion of drivers at high BACs in the second survey cannot be accounted for by differential contributions from each of the 19 ASAPs.

Proportions of drivers falling into each BAC level were calculated for each project and are presented in Figure 46. When this was done it was found that the proportion at or above .05 percent in the second survey was below the proportion at or above .05 percent in the first survey in 15 out of the 19 cases. In one case, Tampa, Florida, there was no change and in the other three there was a rise. One of those was Albuquerque, some of whose first survey results appear to be invalid. A second of these was Columbus, Georgia, whose first survey results were unusually low. They found no drivers at BACs above .15 percent.

Consideration of "Alternate Hypotheses" for Reduction in Roadside Survey BACs. Because of the importance of the finding that the ASAPs do have an impact in reducing the average BAC levels in drivers using the roads, it is well, before accepting the conclusion that this has occurred, to review the potential competing hypothesis listed in Figure 5. The possibility can be rejected that *"instability"* accounts for the result on the basis of the Chi Square Test results that indicated that there was less than one chance in a hundred that this reduction would have occurred as a result of random fluctuations. The possibility that the *"instrumentation"* hypothesis might account for the result is not compelling, since if the methods and techniques used in the survey are improved, there would be a tendency to expect that the BACs obtained would go up as the survey personnel become more skillful. A study by the survey group for the Washtenaw ASAP indicated that drivers who refuse are more likely to be at a higher BAC level than those who agree to take a breath test. As the survey team becomes more skillful, it is to be expected that they will have fewer refusals. As can be seen from Figure 42, there was a slight increase in the average number of drivers measured in relationship to the total number of vehicles stopped between the first and second survey. The average for the first survey was .89 percent, whereas the average for the second survey was .91 percent. This difference is probably too small to be of any significance, but to the extent that it is significant it would be expected to *increase* rather than to *decrease* the average BACs in the second survey.

The other types of procedural errors likely to occur in roadside surveys should also tend to result in increased rather than decreased BACs on the second survey. A failure, for example, to get sufficient expired air from the individual being tested can result in a BAC measurement that is too low. Experience, which results in improved technique, will produce higher, rather than lower, BACs. The only type of error that can produce a spuriously high reading is the type that apparently occurred in Albuquerque, where individuals were tested who still had mouth alcohol. Overall, it would appear that the *"instrumentation"* hypothesis is not a persuasive one for accounting for this observed reduction in BACs between the first and second surveys. Rather, improvements in instrumentation and technique in the present instance, should have resulted in a higher rather than a lower average BAC on the second survey.

FIGURE 46

SUMMARY OF ROADSIDE SURVEY RESULTS

19 ASAPS

BAC Interval	% of all Drivers Tested in Interval		Reduction from Baseline to Operational	Reduction from Baseline to Operational
	First Surveys	Second Surveys		
.05 to .09% Interval	.080	.076	.004	5%
.10 to .14% Interval	.031	.029	.002	6.4%
Above .15% Interval	.018	.014	.004	22%

18 ASAPS*

BAC Interval	% of all Drivers Tested in Interval		Reduction from Baseline to Operational	Reduction from Baseline to Operational
	First Surveys	Second Surveys		
.05 to .09% Interval	.082	.075	.007	9%
.10 to .14% Interval	.031	.029	.002	7%
Above .15%	.015	.011	.004	27%

*See Table 41 for ASAPs.
Albuquerque has been excluded.

The competing hypothesis of *"testing"* is not likely in the present instance, since if the project preparations resulted in a reduction in the number of drinking drivers on the first survey this would work against being able to show a further reduction between the first and second surveys. Thus, the hypothesis, that some of the development activity for the project occurring during the planning phase of the ASAP accounted for this difference, is not pertinent in the present instance, since, if it did indeed exist, it would tend to reduce the difference between the first and second testing rather than increase it.

The competing hypothesis of *"maturation"* is not compelling. It would have to refer to a national, rather than a local trend, since it occurred across most of the 19 projects. What trend, if any, may exist nationally in proportion of drinking drivers on the road is unknown. There is little reason to believe that this trend is downward. On the contrary, the increasing liquor sales, and the increasing automobile mileage suggests that if there is a long-term trend, it is likely to be in the upward, rather than in the downward direction. However, while total nighttime crashes increased nationally from 1971 to 1972, they decreased in proportion to daytime crashes (see Figure 56). This may give support to the possibility of a national trend toward fewer drinking drivers. The existence of a national downward trend in drinking drivers cannot be completely eliminated; there are no roadside surveys during this time period at non-ASAP sites. The

NHTSA is initiating a National Roadside Survey Program in the Fall of 1973 which will provide an estimate of the number of drivers at high BACs on the nation's roads. Greater confidence can be placed in the ASAP survey results when a measure of the national trend is available.

Nor is the hypothesis that a contiguous *"historical"* event would account for this change, since there is no record of any event that should have markedly affected the drinking or the driving habits of the individuals involved. Furthermore, the period of time between the two surveys varied from project to project so that any relatively short-term event would be expected to be counteracted by the timing of the surveys.

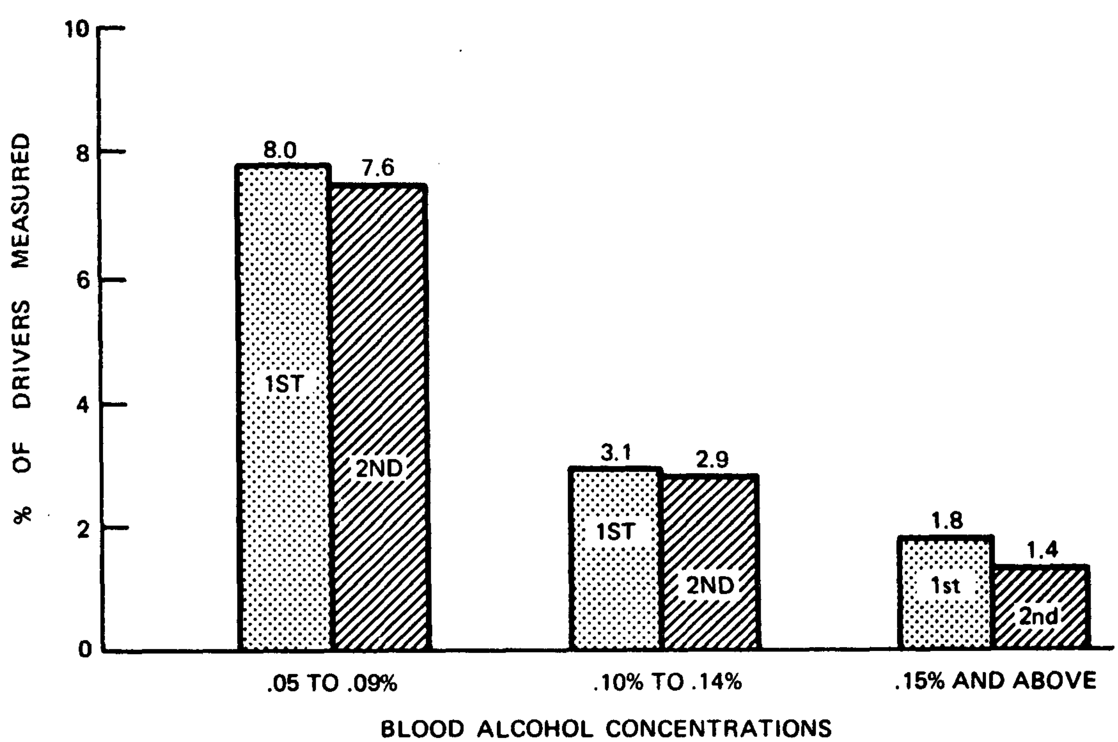
Finally, the hypothesis of *"regression"* is not particularly persuasive. First of all, there is no evidence that 1970 and 1971 were unusually high years for drinking and driving. Therefore, there is no reason to expect a regression to a lower level in 1972.

In summary there are no fully persuasive alternate hypotheses to account for these results. Nevertheless, the results are relatively small at this time and must be very cautiously interpreted pending the collection of data from the third roadside survey, which will be conducted at these same sites.

The changes in the proportion of drivers in the three key BAC intervals are presented graphically in Figure 47. As can be seen, small average reductions were made in the proportion of drivers in each interval. While these reductions are very small, they are sizable when compared to the relatively small numbers of drivers who reach these BAC levels. Thus, for the interval above .15 percent there was a four-tenths of one percent reduction, which, however, was over twenty percent of the one-and-a-half percent of drivers falling into this interval on the first survey.

FIGURE 47

REDUCTION IN DRINKING DRIVERS USING THE ROAD BUT NOT IN ACCIDENTS FROM THE FIRST (BASELINE) TO SECOND (OPERATIONAL) SURVEYS AT 19 ASAPs

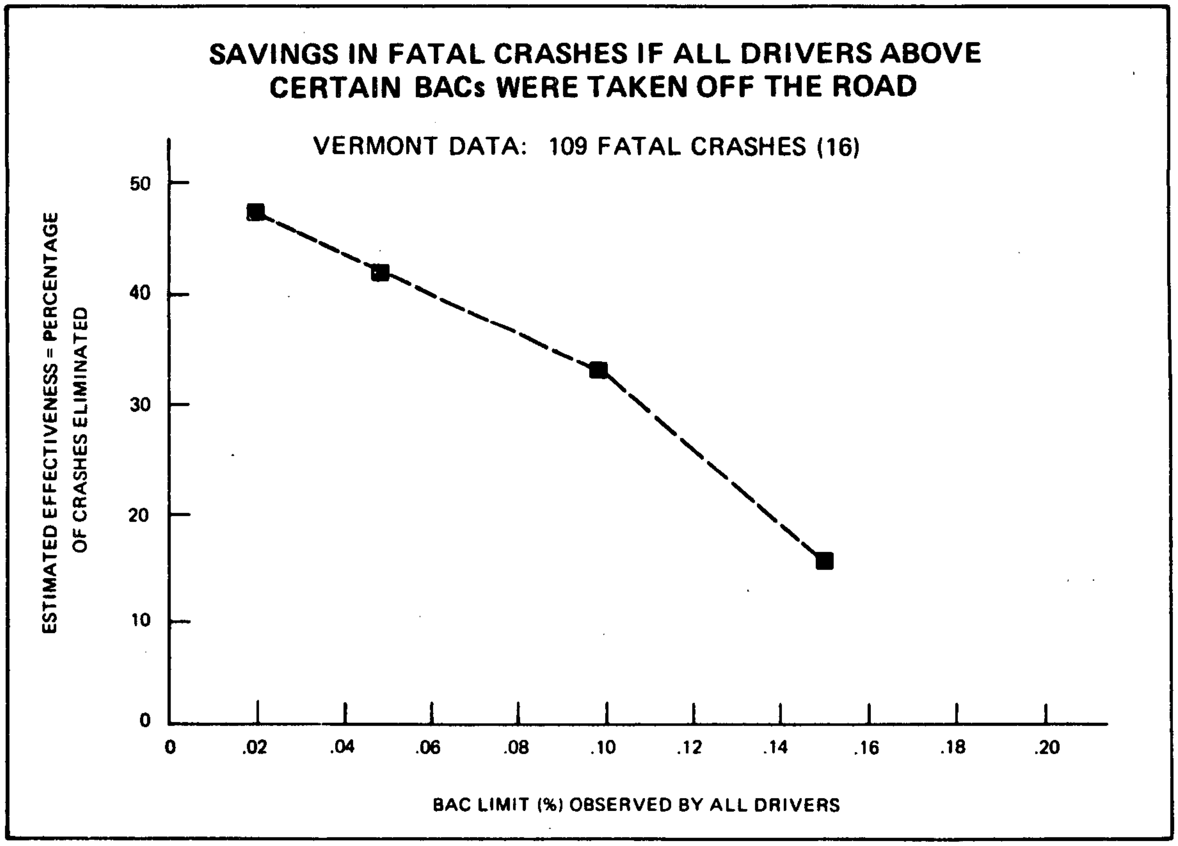


Implication of Roadside Survey BAC Reduction for Fatal Crashes. The importance of this change can be guaged by referring to Figure 48, which gives the calculated savings in fatal crashes if all drivers with BACs above a certain level were to be eliminated from the road (16). As this graph shows, elimination of all drivers above .15 percent BAC should result in a 17 percent reduction in fatal crashes. In the present case a 22 percent or one-fifth reduction in the drivers above this level was actually observed. This should result in approximately a 3 to 4 percent decrease in total fatal crashes at the ASAPs. As the analysis of fatal crash trends given later in this chapter indicates, it is not yet possible to determine whether a decrease of this size has occurred.

It is fair to ask whether, having found evidence that there was a small reduction in the number of drinking drivers using the road, we can definitely expect a reduction in fatal crashes. The answer is clearly "not necessarily." First, it is to be expected that a period of time must pass at the lower BAC level in order for there to be sufficient road miles driven to accumulate sufficient crash data to demonstrate the reduction, if it occurs. Secondly, it is possible that the ASAP removes from the road those drinking drivers who are least likely to be involved in crashes. While the crash risk level goes up on an average for all drivers as a function of the amount of alcohol consumed, it does not go up equally for all drivers. Since the risk level is not equal for everyone, it is at least conceivable that those individuals who are most amenable to responding to a countermeasures campaign are also those who are least likely to become crash involved when they drink heavily. If this is the case, a reduction might be expected in the proportion of drinking drivers at high BAC levels without a consequent reduction in the crash rates. Only as more programs make use of the roadside survey technique will it be possible to determine the extent to which a reduction in the number of drinking drivers using the road will be directly reflected in a reduction in alcohol-related crashes.

Characteristics of Nighttime Drivers. In addition to the basic question of whether the ASAPs have produced a significant reduction in the number of drinking drivers on the road, the results of the voluntary

FIGURE 48



roadside surveys provide information on two other questions of importance to countermeasure programs. The first of these is: What are the characteristics of nighttime drinking drivers? Several analyses of this question have beeen made by ASAP evaluators (6, 7).

Figure 49 shows the age distribution of the drivers stopped in a selection of the roadside surveys conducted by the ASAPs. As can be seen from this figure, young drivers within the 20-year age group are greatly overrepresented in the nighttime driving population in relation to their proportion in the licensed driver population. This overrepresentation occurs in cities such as Kansas City, San Antonio, and Albuquerque, as well as in relatively rural areas such as Vermont and South Dakota. Those in the 30-, 40-, and 50-year age group are underrepresented in the nighttime population as compared to the proportion of the licensed drivers which they represent, while the elderly over 60 are highly underrepresented.

Note that Figure 49 gives the age distribution of *all* drivers stopped, not necessarily of the drinking drivers. Several project evaluators noted the similarity of these age distributions for drivers using the road

FIGURE 49

AGE DISTRIBUTION OF DRIVERS USING THE ROAD AT NIGHT

SEVEN ASAP AREAS

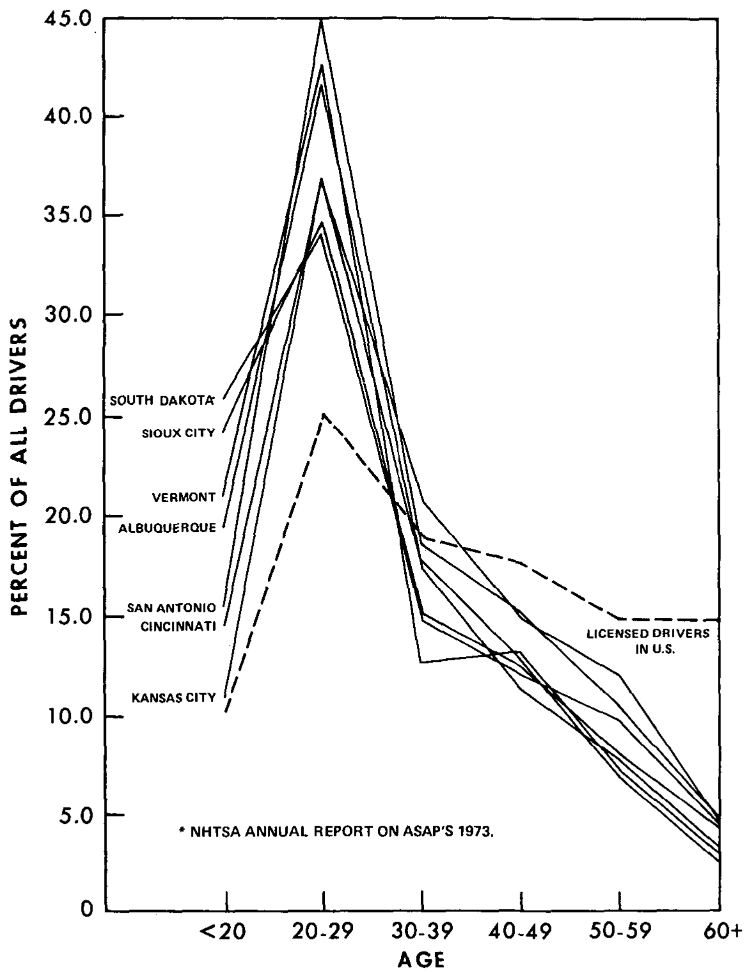
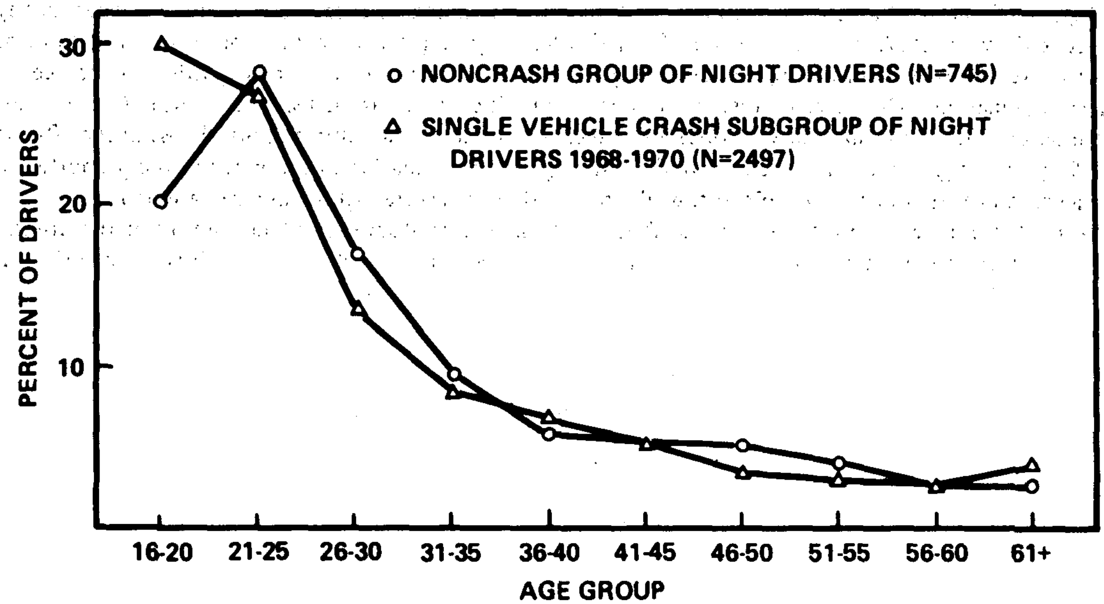


FIGURE 50

DISTRIBUTION OF SINGLE-VEHICLE CRASH AND NON-CRASH NIGHT DRIVERS BY AGE GROUP*



*CARLSON, J. SAF. RES. IV, 1, 1972

and the age distributions for drivers involved in crashes. Data collected on the Washtenaw County roadside survey are shown in Figure 50 (6). These results indicate that in the single vehicle crash subgroup, the age distribution is very similar to the age distribution of drivers using the road at night at each age interval with the exception of the teen-age driver. The teen-age driver is, next to the driver in the 21- to 25-year-old group, the largest single age category present on the road during nighttime. Moreover, his crash involvement is proportionately even greater. While the under 20 driver represents 20 percent of all the drivers on the road, he is involved in 30 percent of single vehicle crashes. Thus, the teen-age driver has an overinvolvement of about 50 percent.

This overrepresentation of the young driver at night is a finding of importance for the enforcement activity. As shown in Figure 51 (9), in Michigan the drivers currently being arrested for DUIL are older on the average than the drivers fatally injured in crashes. They are also older on an average than the drivers who are found to have been drinking in roadside surveys. This raises the possibility that the police may be missing the younger highest risk drinking driver.

Also of interest is the relative size of the reductions shown in Figure 46 in the proportion of drivers in each of the significant BAC intervals. It has been suggested (23) that since the distribution of BACs in a randomly selected population of drivers using the road fits a log-normal distribution, the number of impaired drivers (over .10 percent) can only be reduced by reducing the average BAC levels of all drivers. As Figure 46 shows, there were reductions at all three significant BAC intervals, but the proportional reductions were much smaller for the .05 percent to .09 percent and the .10 percent to .14 percent intervals than for the interval above .15 percent BAC. This suggests that the impact of countermeasures programs can have a differential effect on the drivers with the highest BACs. The proportions of drivers at these levels can be significantly reduced with only relatively small impact upon more moderate drinkers.

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FIGURE 49

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SEVEN ASAP AREAS

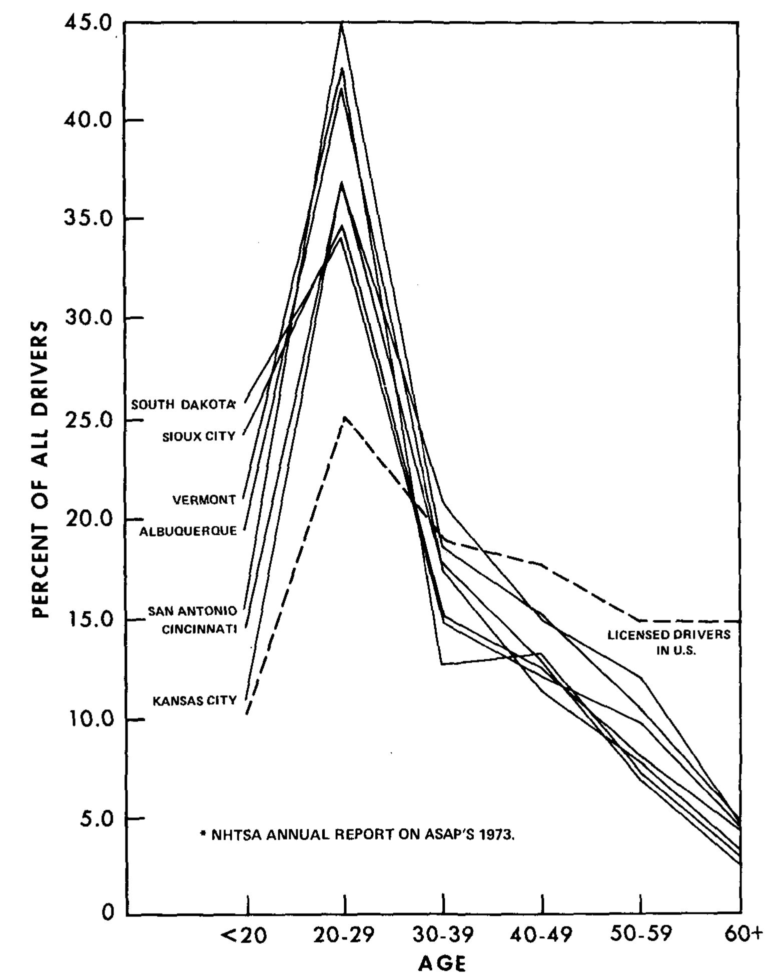
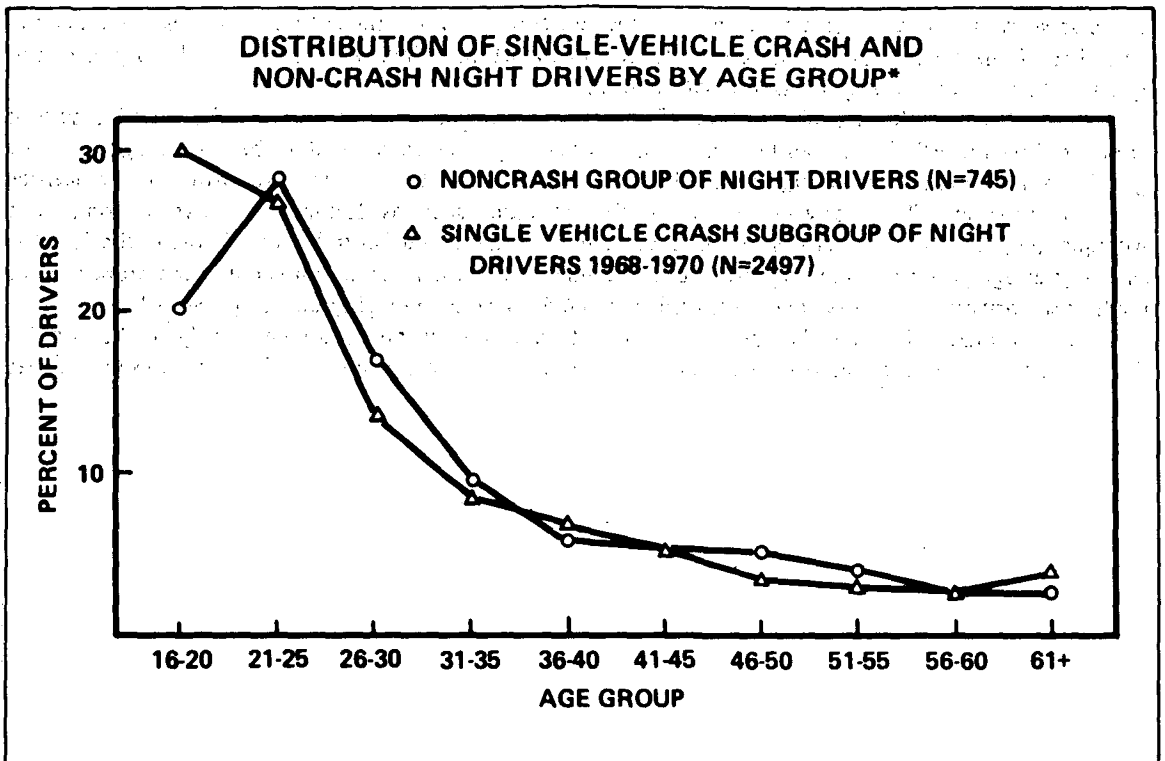


FIGURE 50



*CARLSON, J. SAF. RES. IV, 1, 1972

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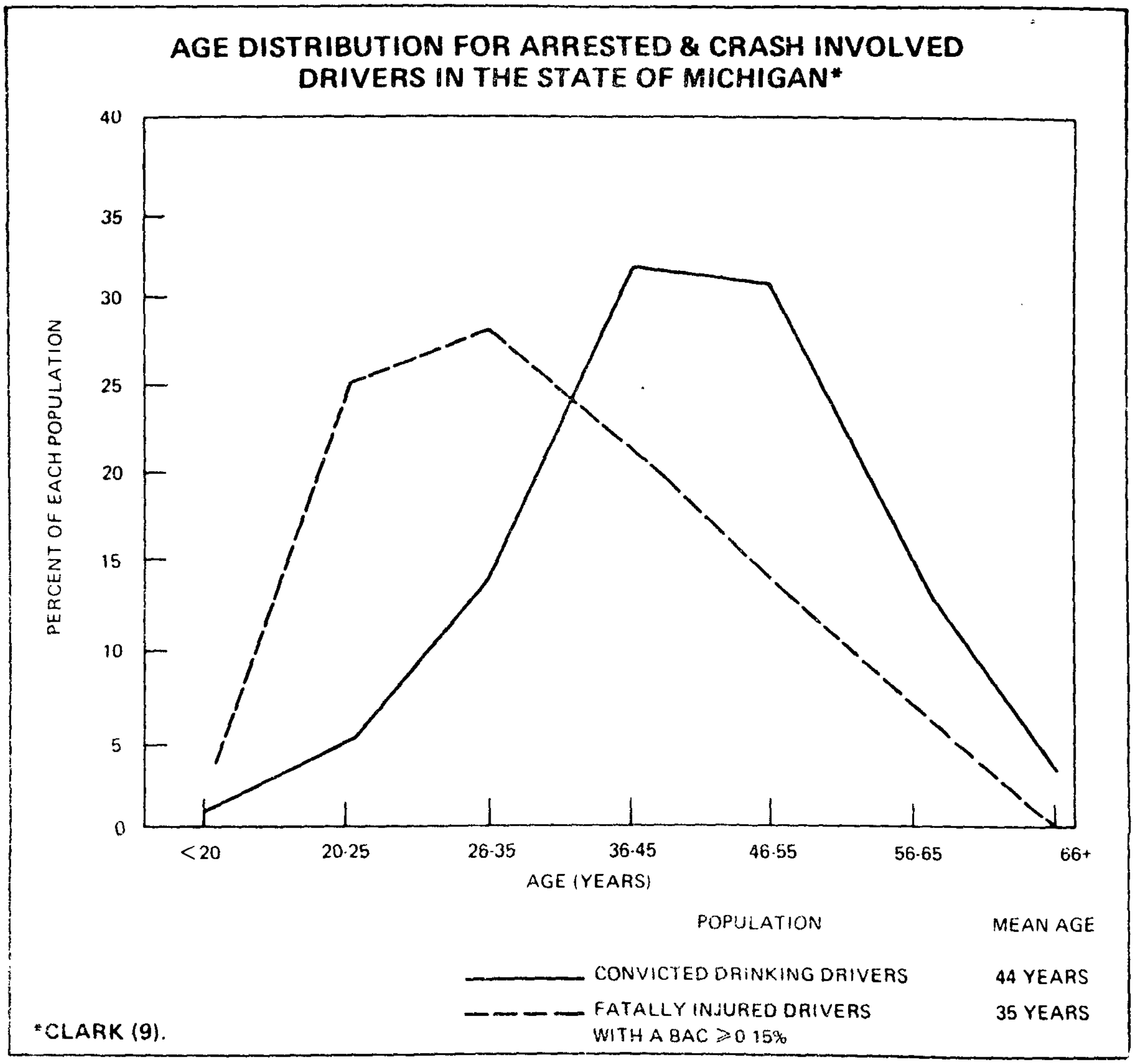
FIGURE 51



*CLARK (9).

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